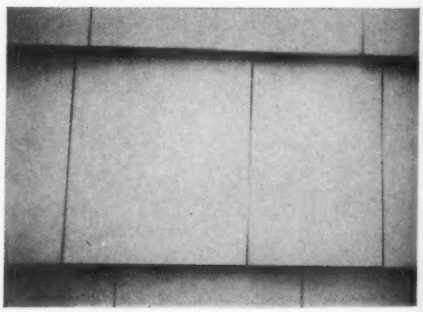
9120 WALLPOL

RCI's PVAc COPOLYMER WITH PROVEN DURABILITY ON EXTERIOR WOOD

This Rahway, N. J., home was coated with a 32% PVC vinyl copolymer emulsion paint to determine the durability of RCI 9120 WALLPOL on previously painted wood. Two coats were applied to the cedar shakes — in April, 1957. No primer was used. The shakes had been painted with linseed oil house paint two years earlier; the surface was in good condition and showed only slight chalking.

The photograph and the close-up attest to the condition of the house — 3 years later. The surface condition of the house is good, with only slight chalking on south and east exposures.

RCI 9120 WALLPOL incorporates all of the latest advances in PVAc emulsion technology. Small particle size, high distensibility and a uniquely balanced emulsifier system contribute to these distinct advantages when used on properly prepared exterior wood:



- *ease of application — spreads easily*
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- *easy soap-and-water clean-up of tools and equipment*
- *retains its appearance for many years — excellent tint retention and low dirt pickup*
- *blister resistant — film allows moisture vapor permeability*
- *permanent flexibility—important for clapboard surfaces*

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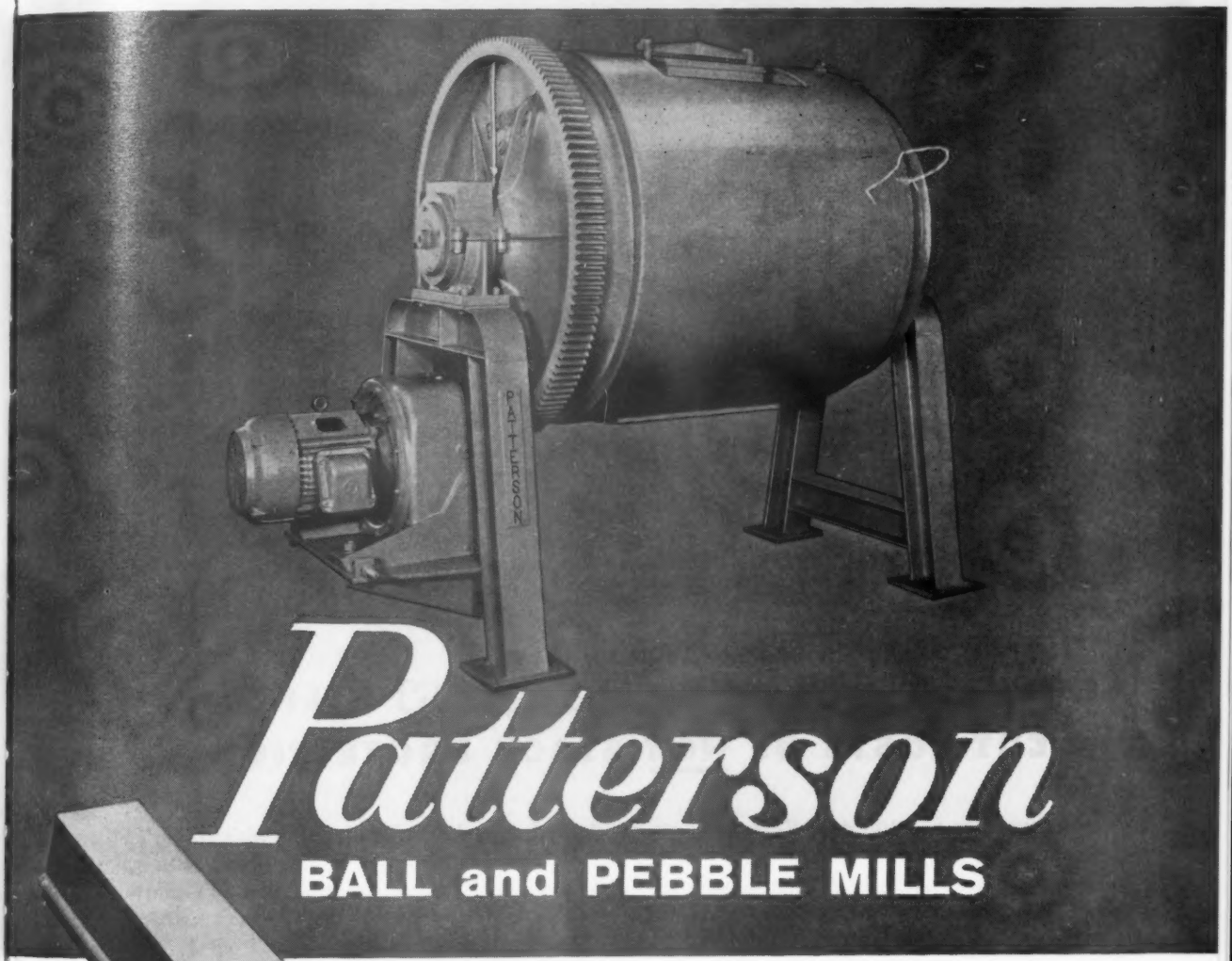

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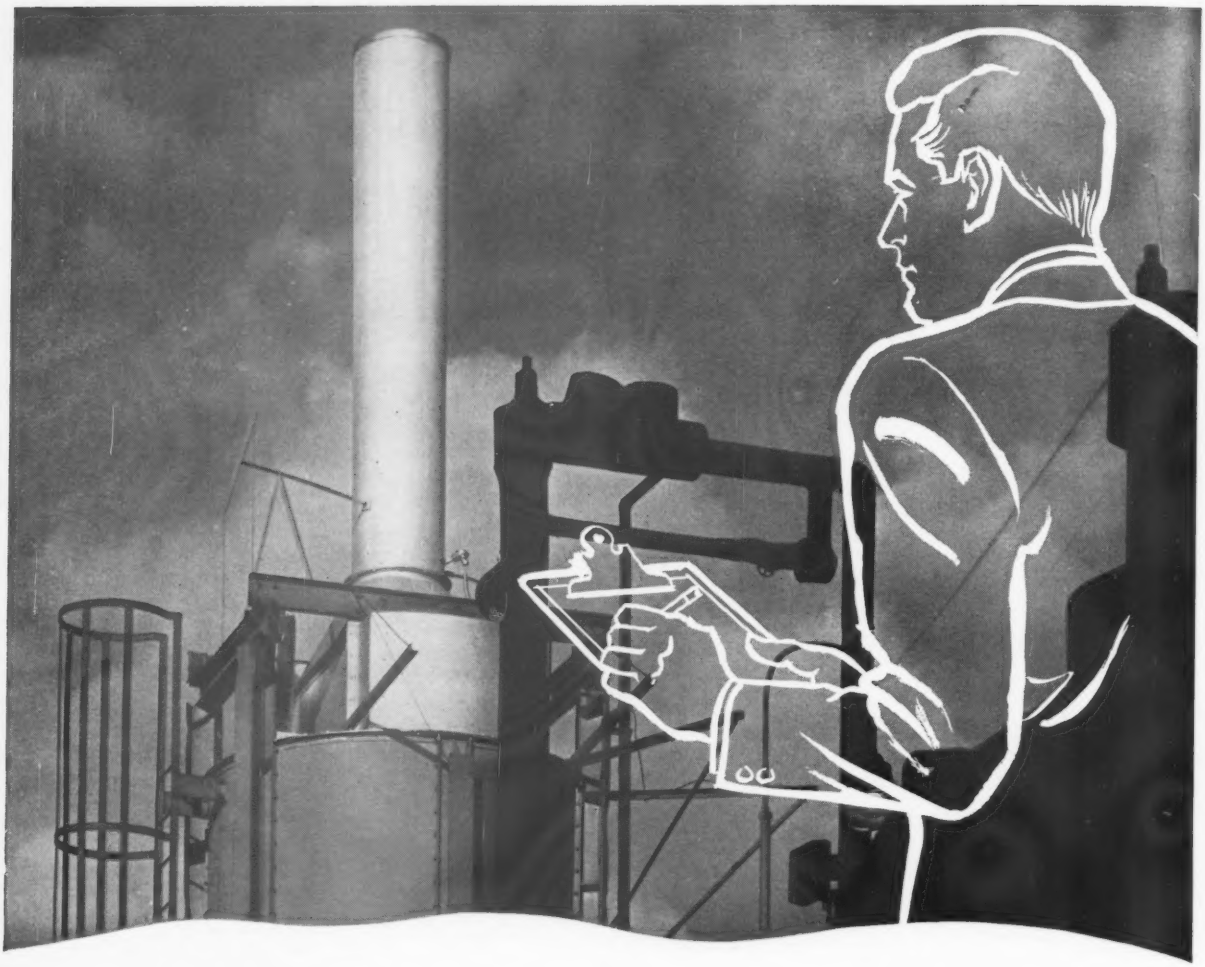

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HEAT RESISTANT to 1200 deg. F., a low-cost, high-temperature silicone-aluminum paint using UNION CARBIDE R-64 Silicone has protected this exhaust stack for six months. And the stack is still like new.

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PAINT and VARNISH PRODUCTION

(REG. U.S. PATENT OFFICE)

DECEMBER 1960

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VOLUME 50
NO. 13

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Paint and Varnish Production Wishes You
A Merry Christmas and a Happy New Year

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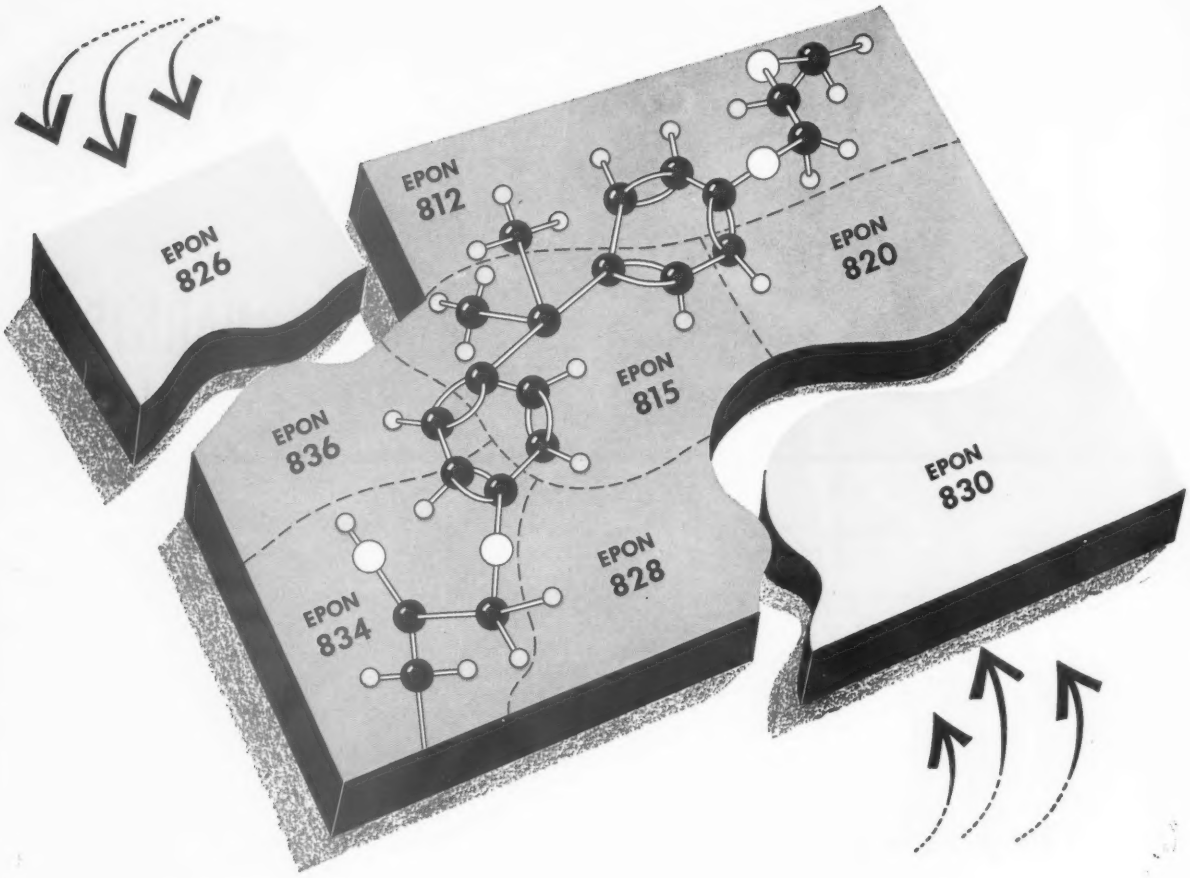

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EDITORIAL COMMENT

Research—The Answer to Competition

"TECHNICAL Manpower—How to Get It—How to Keep It" was the subject of an interesting panel discussion of the Chemical Coatings Conference held at the recent annual Meeting of the National, Paint, Varnish and Lacquer Association in Chicago.

W. R. Barrett (Rinshed-Mason Co.), one of conference participants strongly urged paint companies to expand their research programs in order to meet stiff competition. In this connection, he recommended that research programs be more diversified and offered three approaches:

"First, we must devote time to development of —day-to-day formulation required to keep up with competition and ever-changing customer needs. This will always be the bulk of our research effort and, therefore, our main technical manpower requirement.

"Unfortunately, because this development is the "short order cook type" research, and it is not attractive to many science-oriented men, the handling of the good technical men who go into this particular phase of our research and development program is a major employee relations problem.

"Second, part of our research budget must be dedicated to offensive applied research, seeking new applications for our products and new products for sale to customers who do not use paint. We must lead, rather than follow, our customers—contrary to the acrylic enamel and lacquer development experience which was virtually forced upon us by the appliance and auto motive industries.

"We must engage in defensive research in order that we may combat the encroachment of competitive industries."

Here he cited the increasing use of porcelain enamel and high-pressure laminants in the appliance and furniture industries.

"If we have enough good technical personnel and are willing to dedicate part of our research expenditures to the goal of combatting the encroachment of competitive industries, we will come up with products superior in performance to the more expensive porcelain enamels and high pressure laminants or any other competitive offering. By the way, I feel these products exist today but we can't convince our customers that they must alter their operations sufficiently to accommodate them.

"If we are to offset the 20 to 40% reduction in our sales through the use of paint-saving devices, and the significant impact of encroachment of competitive industries, we must spend more money for research and it must be spent in the area of creating new products for new uses rather than for the purpose of taking business away from each other, only to lose it again the following month."

In the third approach, Mr. Barrett dwelt on the importance of fundamental and applied research to solve some of the technical problems confronting the paint industry. Here Mr. Barrett mentions two examples: (1) the development of a universal pigment-dispersion that can be readily mixed with any conceivable vehicle system and (2) the need of a scientific method for controlling steel ball mill processing.

It is in the latter example that chemical engineering research will help to solve the problem of steel ball milling for as every technician knows, neither fineness of gage nor the use of a "grinding-for-so-many hours" criteria is a satisfactory measure of the quality and performance of a product which emerges from a steel ball mill.

"Our industry requires chemical engineers and technically-trained production personnel who have the vision and knowledge necessary to develop more efficient production methods and who consider a complicated paint processing technique a challenge rather than an imposition Too often, the production divisions of the chemical coatings manufacturers curtail the development labs by insisting that the *product of tomorrow be produced by yesterdays' manufacturing methods.* We need production men who consider it a privilege to go through elaborate and involved process methods if this yields a uniquely desirable product."

It will be worthwhile for executives of the paint industry to ponder Mr. Barrett's remarks as they are most significant in light of the inroads which competitive products have been making in markets that traditionally belong to paint.

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new syl-ad additives

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- *application*
- *appearance*
- *sales*

for you!

syl-ad additives, a new group of improved paint additives, are the latest advance in Dow Corning's continuing development of new and better silicones to aid paint formulators. Engineered to increase efficiency in application as well as improve durability and appearance of protective coatings, new *syl-ad* additives, used properly, always give uniform results . . . are your best assurance of quality that brings complete customer satisfaction.

EASY TO USE

In formulating with *syl-ad* additives, effects should be carefully tested *before* production runs. It is best to blend additives *after* paint is removed from processing equipment because residual silicones remaining in equipment may affect subsequent batches. Each *syl-ad* is supplied in a toluene solution. Should dilution be necessary, aromatic solvents, mineral spirits or ketones may be used.

When used in recommended concentrations, *syl-ad* additives overcome most of the recoating difficulties formerly attributed to silicone additives. Where recoatability is required, the coating should be washed with solvent and then wet-sanded, using a one percent detergent solution.

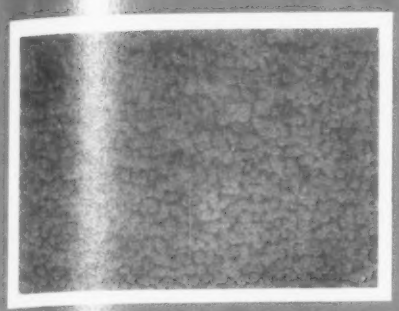
NOTE: *Because* ***syl-ad*** *additives are effective in very low concentrations, avoid using excessive amounts.*

CONVERSION TABLE

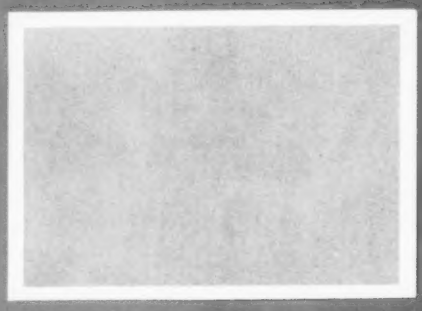
All recommendations and suggestions presented in this brochure are based on percentage of *syl-ad* additives to be added to the coating, by weight. The table below gives equivalents of percent in other units.

Percent (by weight)	Parts per Million	Pounds per hundred pounds	Pounds per hundred gallons*
0.01	100	0.01	0.1
0.1	1,000	0.1	1.0
1.0	10,000	1.0	10.0

* Based on a coating weight of 10 pounds per gallon. If a gallon weighs less, for example 8.0 pounds, using 0.8 pounds per hundred gallons would give 1000 parts per million. Likewise, using 1.0 pounds per hundred gallons would give 1250 parts per million. In most cases, this difference would not be significant.



Acrylic baking enamel sprayed on panel; baked 15 minutes at 350 F. Pigment: mixture of titanium dioxide and phthalocyanine blue. Floating is extreme.



Identical enamel and pigment as used on panel at left; paint also sprayed and baked at 350 F for 15 minutes. Concentration of only 0.5 percent of *syl-ad* 1 eliminated floating.

syl-ad 1

prevents

- **FLOATING**
- **FLOODING**
- **SILKING**

recoatable

This *syl-ad* additive is an efficient new "tool" developed to assist you in formulating coatings that provide maximum pigment control. Special surface preparation is not usually required when recoating finishes containing up to 0.1% of *syl-ad* 1, and wetting is excellent when second coating is applied. Note the low concentrations needed to obtain the desired results in several different types of coatings. See table below.

SUGGESTED CONCENTRATIONS

Type of Coating	Percent *syl-ad* 1	Pigment Floating
Acrylic Lacquer	0	Severe
	0.05	Trace
	0.10	None
Acrylic Baking Enamel	0	Severe
	0.02	Trace
	0.05	None
Alkyd Melamine	0	Moderate
	0.02	Trace
	0.05	None
Long Oil Soya Alkyd	0	Moderate
	0.02	Trace
	0.05	None

TYPICAL FORMULATION

Alkyd Melamine Baking Enamel

	Pounds
Plaskon 3105	37.6
Uformite MM-55	19.3
Titanium Dioxide	31.7
Phthalocyanine Blue	0.5
Xylene	10.5
syl-ad 1 (reduced 1 to 10 with toluene)	0.4
	100.0

Coating should be baked 30 minutes at 300 F.

syl-ad 2

prevents

- **FLOATING**
- **FLOODING**
- **SILKING**

cannot be recoated

SUGGESTED CONCENTRATIONS

Type of Coating	Percent *syl-ad* 2	Pigment Floating
Acrylic Lacquer	0	Severe
	0.05	Trace
	0.10	None
Acrylic Baking Enamel	0	Severe
	0.02	Trace
	0.05	None
Alkyd Melamine	0	Moderate
	0.02	Trace
	0.05	None
Long Oil Soya Alkyd	0	Moderate
	0.02	Trace
	0.05	None

TYPICAL FORMULATION

Air-Drying Alkyd Trim Paint

	Pounds
Aroplaz 1241	51.6
Linseed Oil (Q bodied)	2.5
Titanium Dioxide	26.6
Zinc Oxide	2.9
Lampblack	0.5
Alumium Stearate	0.3
Mineral Spirits	7.4
Stoddard Solvent	7.0
Calcium Drier (5%Ca)	0.4
Cobalt Drier (6% Co)	0.3
Antiskinning Agent	0.1
syl-ad 2 (diluted 1 to 10 with toluene)	0.4
	100.0

syl-ad 2 additive is similar to *syl-ad* 1, but was specifically developed for applications in which economy is important and recoatability is of no concern. *syl-ad* 2 provides the paint formulator with a high-performance method of improving the application of protective coatings.

syl-ad 6

improves

- LEVELING
- FLOW-OUT
- WETTING

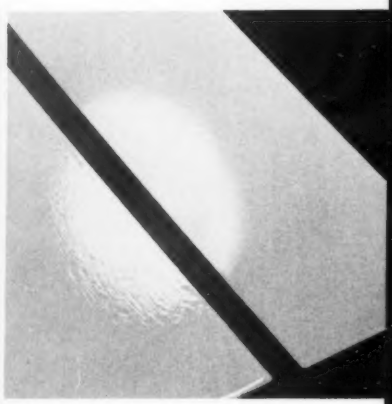
SUGGESTED CONCENTRATIONS

Type of Coating	Percent *syl-ad* 6	Leveling Properties
Acrylic Lacquer	0	Poor
	0.5	Fair
	1.0	Excellent
N. C. Lacquer	0	Poor
	0.5	Fair
	1.0	Excellent
Butyrate Lacquer	0	Poor
	0.5	Fair
	1.0	Excellent
Unsaturated Polyester Resin	0	Poor
	0.05	Fair
	0.1	Excellent

TYPICAL FORMULATION

Polyester Resin Coating

	Pounds
Polylite 8703	81.9
Cobalt Drier (6% Co)	0.8
MEK Peroxide	0.8
Styrene	16.3
syl-ad 6	0.2
	100.0



Panels dipped in nitrocellulose automotive lacquer, then air-dried. At left, ridges are pronounced. Addition of only 1.0 percent concentration of *syl-ad* 6 ends ridging, at right; surface is smooth, even.

Specially developed by silicone chemists to simplify application of lacquers and paints, *syl-ad* 6 improves flow-out and leveling in dip coating operations and reduces orange peel in spray processing. Pre-evaluation of this additive is important, since the necessary concentrations vary somewhat, depending upon the solvents used in the lacquer.

The function of *syl-ad* 11 is to reduce the surface friction of coatings. As a test of effectiveness, a panel and a cylinder were coated with the same paint and cured. The cylinder was placed lengthwise on the horizontal panel. One end of the panel was raised until the cylinder began to slide. The angle at which the plane was inclined when slippage occured was termed the "slip angle". The tangent of this slip angle is the coefficient of friction.

TABLE OF COEFFICIENT OF FRICTION

Type of Coating	Percent of *syl-ad* 11	Slip Angle (in degrees)	Coefficient of Friction
Vinyl (Can Coating)	0	34	0.675
	0.5	8	0.141
Alkyd Melamine	0	30	0.576
	0.5	9	0.158
Acrylic Baking Enamel	0	42	0.90
	0.5	12	0.21
Acrylic Lacquer	0	30	0.575
	0.5	14	0.250

TYPICAL FORMULATION

Acrylic Appliance Finish

	Pounds
Acryloid AT-50	57.4
Epoxy D.E.R. 661 (60% NVM in MIBK)	8.5
Titanium Dioxide	20.6
Xylene	8.1
Solvesso 150	2.3
Cellosolve Acetate	2.6
syl-ad 11	0.5
	100.0

Coating should be baked 30 minutes at 300 F.

syl-ad 11

GIVES PAINTS MORE SURFACE "SLIP" IMPROVES MAR-RESISTANCE

By giving protective coatings a high degree of "slip", this new silicone additive provides an exceptional resistance to surface damage. Attacking elements cannot obtain the "bite" that leads to surface scoring and, eventually, to deeper damage. Finishes containing *syl-ad* 11 also appear harder because of their smooth, slippery feel.

syl-ad 16

CREATES TEXTURED FINISHES

This additive imparts excellent textured finishes—including hammer finishes—to protective coatings. The type of finish obtained depends upon the enamels involved. With baking and air-drying enamels, a textured finish results; with enamels containing non-leafing aluminum pigments, a hammer finish is obtained.

Because the results obtained vary with different coating formulations, a concentration table for *syl-ad* 16 would be of little practical use. For textured finishes, the desired concentrations range from 0.05 to 0.5 percent. For hammer finishes, suggested concentrations range from 0.1 to 0.5 percent. As the concentration increases, the grain in the finished coating becomes finer.

In every case, however, careful evaluation on a trial basis should always precede use of *syl-ad* 16 on a production scale.

TYPICAL FORMULATION FOR TEXTURED FINISH

Alkyd Melamine

	Pounds
Plaskon 3105 (60% NVM)	27.3
Uformite MM-55 (50%NVM)	14.1
Titanium Dioxide	21.1
Magnesium Silicate	14.1
Xylene	23.3
syl-ad 16	0.1
	100.0

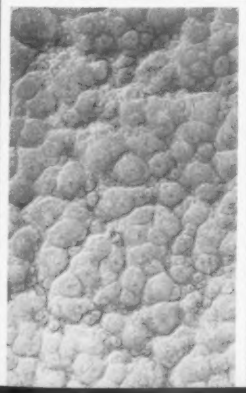
This formulation gives a spraying viscosity of 80 seconds in a No. 4 Ford Cup. Coating should be baked 5 minutes at 300 F.

TYPICAL FORMULATION FOR HAMMER FINISH

Lacquer

	Pounds
Alcoa 1593 Aluminum Paste	2.0
Nitrocellulose, ½ second	13.2
Plaskon 3105 (60% NVM)	18.6
Butyl Acetate	13.2
Ethyl Acetate	13.2
Toluene	39.5
syl-ad 16	0.3
	100.0

This formulation gives a spraying viscosity of 50 seconds in a No. 4 Ford Cup.

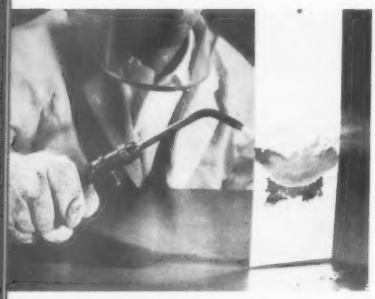


Both panels sprayed with alkyd melamine, pigmented with non-leafing aluminum tinted with iron oxide; panels then baked 15 minutes at 350 F. Coating on panel with large grain (at left) contained *syl-ad* 16 in concentration of 0.02 percent. By increasing to 0.8 percent, fine grain coating at right was achieved.

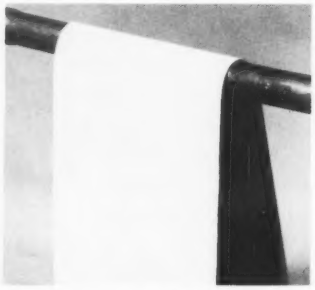
for paints that last longer . . .
formulate with

DOW CORNING SILICONES

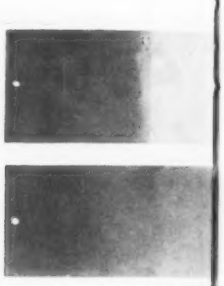
In addition to the new *syl-ad* additives, Dow Corning also markets a full complement of silicone resin vehicles for formulating paints with resistance to heat (as high as 1000 F); immunity to moisture; capacity to withstand weathering. Paints based on Dow Corning silicone resins retain full color and gloss, flexibility and adhesion . . . can be produced in a full range of colors . . . make exceptional product finishes. For detailed information about silicone resin vehicles for paint formulation, contact the Dow Corning office nearest you.



Silicone-based paint survives heat to 1000 F; maintains good adhesion; remains unaffected by rain, sun, salt spray.



Silicone-based paint takes 180° bend on ¼" mandrel with no crazing, checking, peeling.



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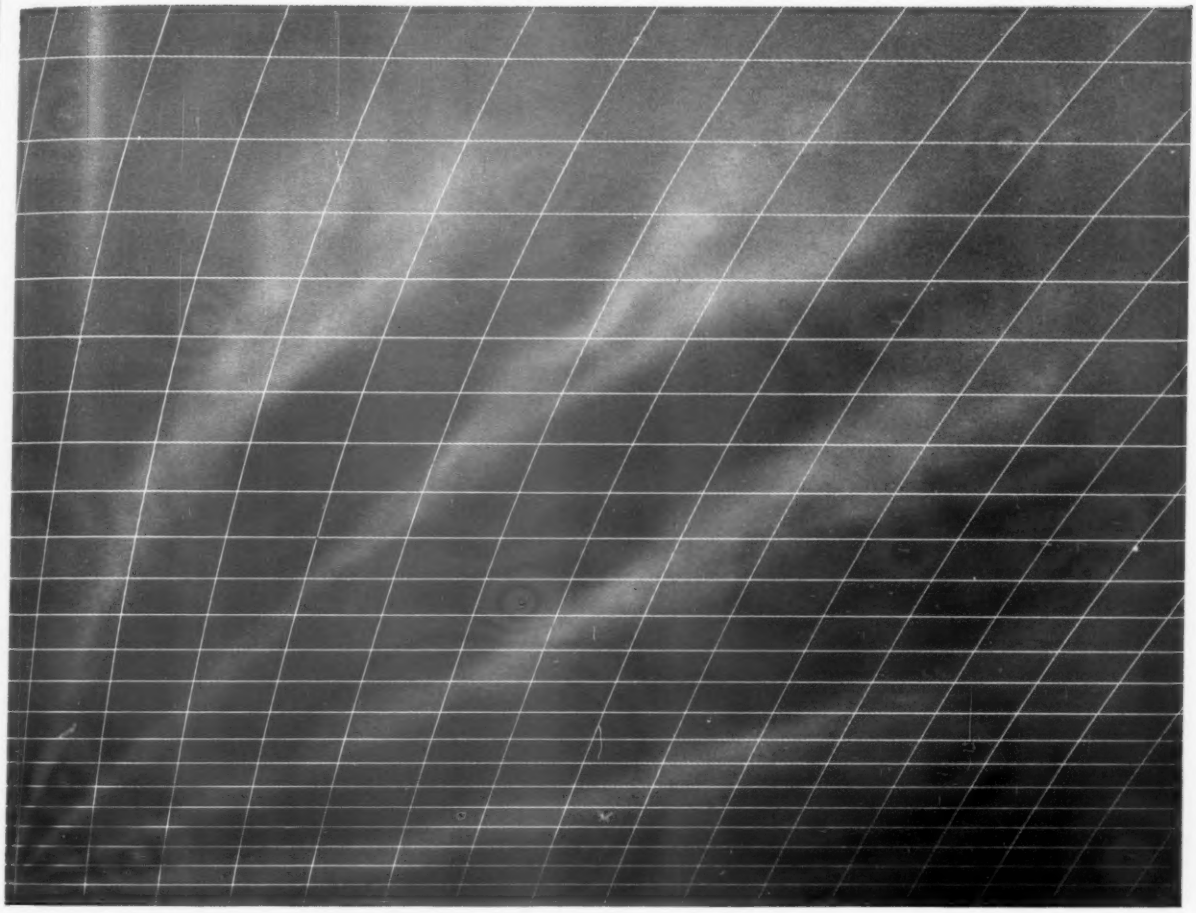

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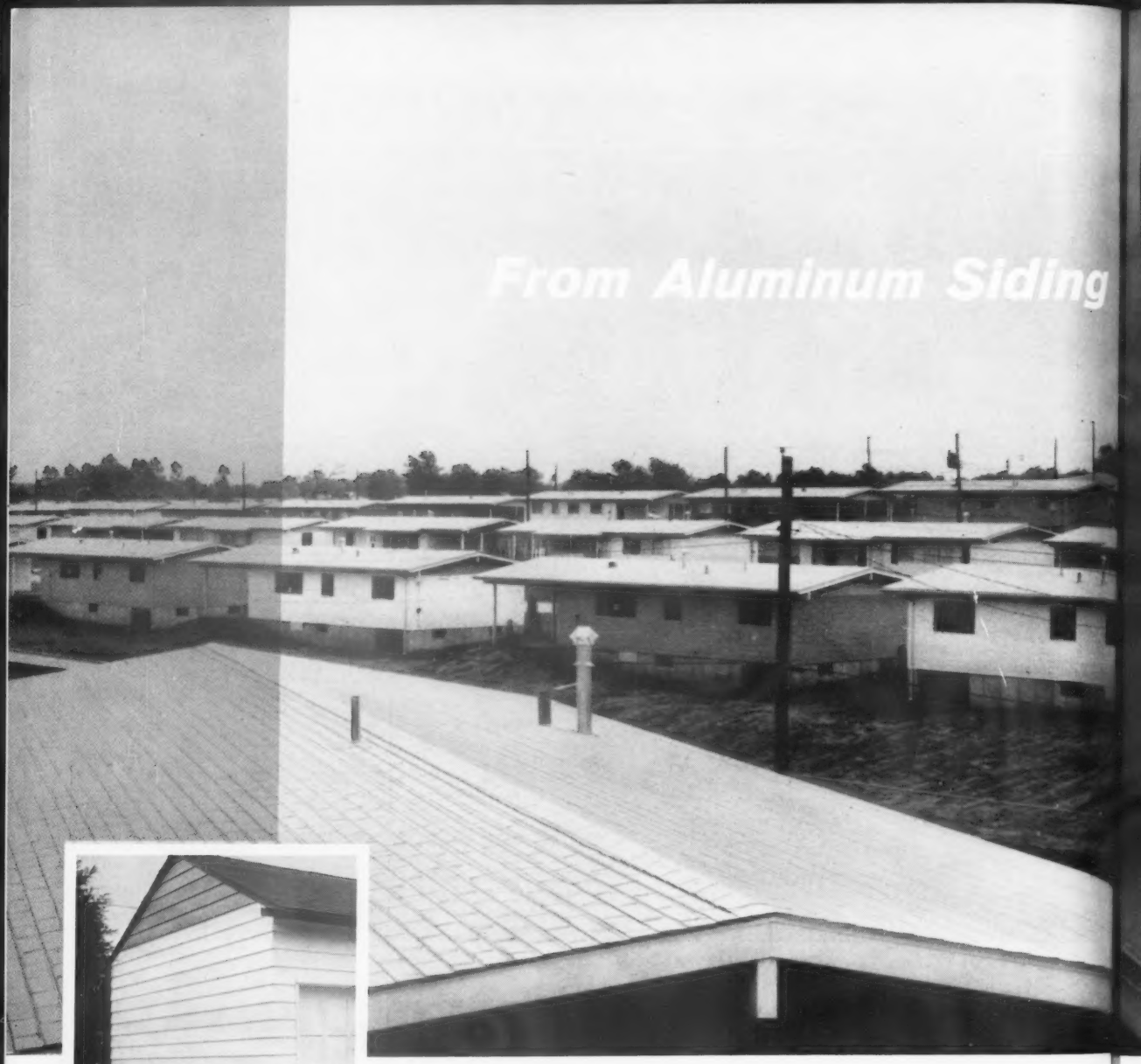

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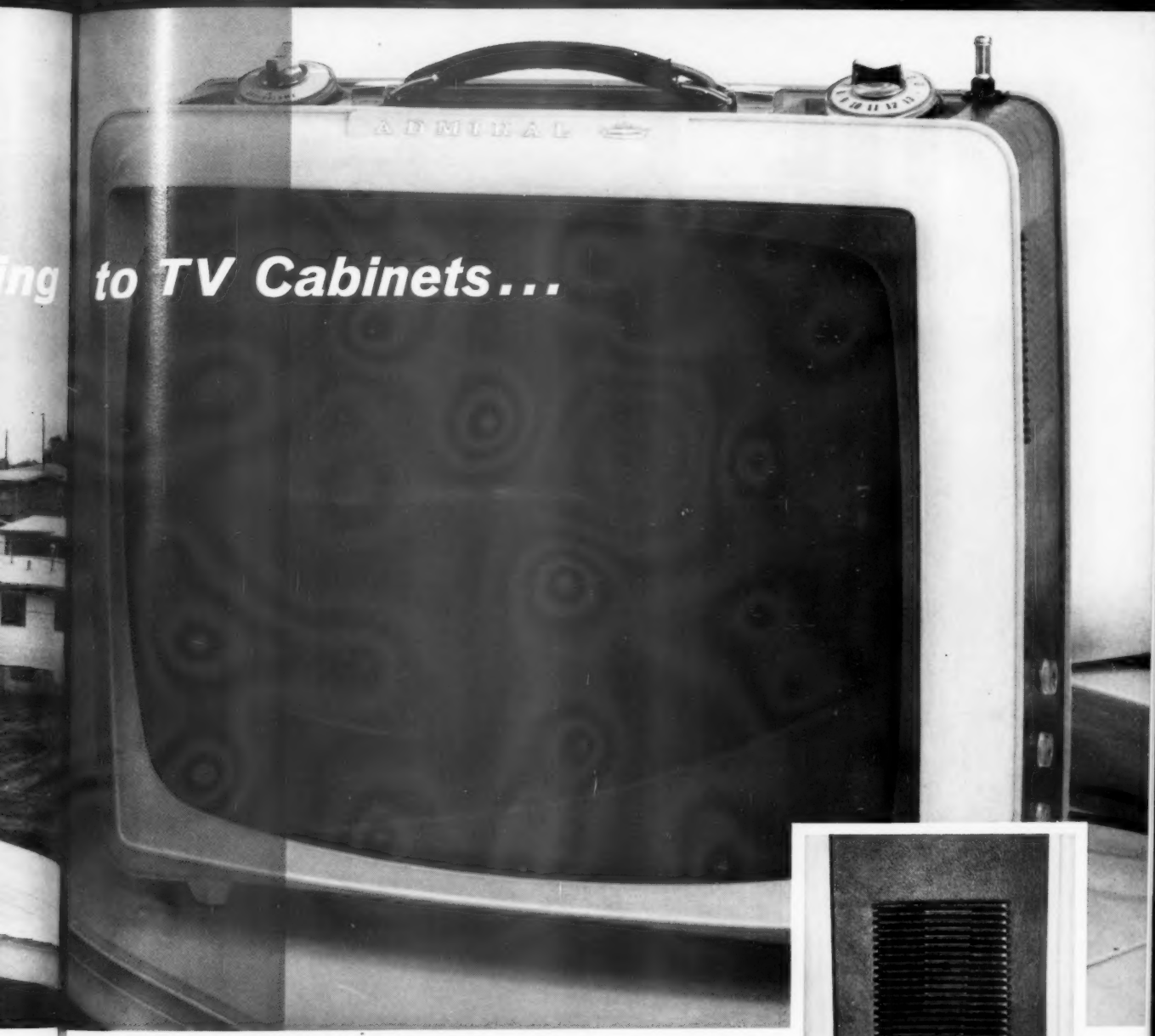

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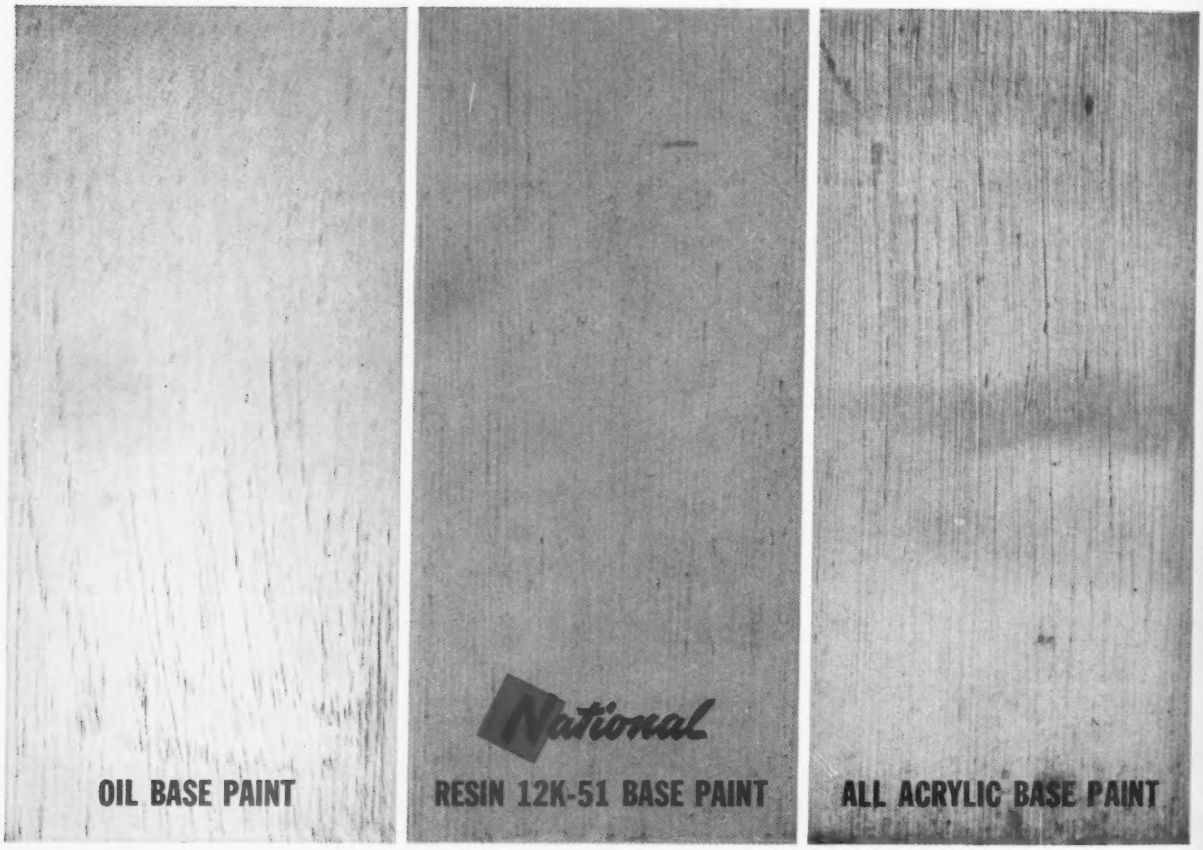

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ANHYDRIDE-CURED EPOXY COATINGS

By
T. J. Hyde*

ABSTRACT

The reaction of two moles of pyromellitic dianhydride (PMDA) with one mole of various glycols produced adducts with high solubility (28-65%) in ketone or ester solvents. The adducts contained both anhydride and carboxylic acid groups. Coating formulations containing conventional solid epoxy resins and PMDA-glycol adducts were developed which attained an excellent balance of physical properties and solvent resistance after a relatively mild cure of 15 to 30 minutes at 300°F. The resistance of the coating to attack by mineral acid, glacial acetic acid, and boiling water was exceptionally good. The shelf life of the formulations was greater than sixty days. The glycol used for most of this work was Dow Resin X-2635. When a polypropylene glycol was used as the glycol component, the cured coating possessed flexibility sufficient to withstand post-forming operations on the steel substrate. Three liquid, polyfunctional epoxy resins could be cured with PMDA-glycol adducts at room temperature in seven days or less to produce coatings with excellent physical properties and MEK resistance.

PYROMELLITIC dianhydride (PMDA) is a useful cross-linking agent which imparts to epoxy resins exceptional thermal stability, good electrical properties, and excellent resistance to organic solvents (References 1 and 2). However, PMDA has a high melting point and limited solubility in common solvents. The objective of the present work was to prepare a derivative of PMDA which would impart desirable properties to cured resins yet also would have a lower melting point, improved compatibility with common resin ingredients, and improved solubility in common solvents.

The type of PMDA derivative which is described in this paper was prepared by the reaction of two moles of PMDA with one mole of a glycol in a ketone or an ester solvent. The major product of the reaction is believed to be represented by structure (I) shown in Figure 1. This product is referred to as a PMDA-glycol adduct. Adduct solutions were used successfully to prepare high-performance epoxy resin coatings after a cure of only 15 to 30 minutes at 300°F. Formulations were also developed to give coatings with extremely good flexibility and coatings which could be cured at room temperature.

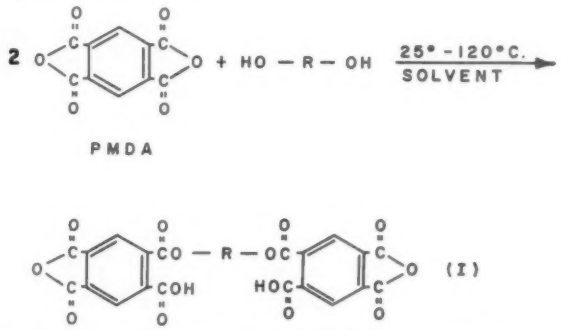

Figure 1. Preparation of PMDA-Glycol Adducts

This paper was presented at the Symposium on Epoxy Resins, Division of Paint, Plastics and Printing Ink Chemistry, American Chemical Society, 136th Meeting, Atlantic City.

*Explosives Department, Sales Development Laboratory, E. I. Du Pont de Nemours & Co., Penns Grove, N. J.

Preparation of PMDA-Glycol Adducts

Experimental. The first objective was the preparation of PMDA-glycol adducts with appreciable solubility in common solvents. For the preparation of the adduct, 1.0 mole of PMDA and 0.5 mole of a glycol were charged to a reactor vessel, and 640 grams of solvent was added. This vessel was equipped with an agitator, thermometer, reflex condenser and an inlet for a dry inert gas. The reaction was carried out under a dry nitrogen atmosphere and usually at the reflux temperature of the solvent. The reaction was continued for 2 hours after the dispersion of PMDA became a clear solution, and then the solution was cooled to room temperature. Whether or not the adduct remained in solution was recorded. Adducts which precipitated out of solution were not given further attention. Ordinarily, the adduct solutions were filtered after they had been cooled to room temperature in order to remove minor amounts of insoluble matter prior to use.

The most effective solvents for the reaction were methyl ethyl ketone (MEK), a blend of methyl isobutyl ketone (MIBK) and MEK (9/1), and "Cellosolve" acetate. Commercial grades of these solvents were used. Water analyses on these solvents

TABLE I

PREPARATION OF PMDA-GLYCOL ADDUCTS

Formulation: 218 g. PMDA

x g. glycol where $x = \frac{\text{mol. wt. of glycol}}{2}$

640 g. solvent

Molar ratio of PMDA to glycol = 1.0 to 0.5

Reactions were carried out in dry N_2 atmosphere; at reflux temperature in MEK and MIBK; at 120°C. in "Cellosolve" Acetate

Explanation of Code Used in "Results" Column:

Ppt.: dispersion of PMDA cleared, but precipitate formed when solution was cooled.

Sol.: dispersion of PMDA cleared, and solution remained substantially clear when cooled to room temperature.

Glycol			MEK		MIBK/MEK (9/1)		"Cellosolve" Acetate	
Name	Wt. (g.)	Wt. % Reactants	Time (hr.)	Result	Time (hr.)	Result	Time (hr.)	Result
Aliphatic								
Ethylene (a)	31	28	—	—	—	—	3	Sol.
Butanediol-1,4 (b)	45	29	—	—	3	Ppt.	4	Ppt.
2-Butenediol-1,4 (b)	44	29	—	—	—	—	2	Sol.
Pentanediol-1,5 (a)	52	30	—	—	—	—	3	Sol.
Neopentyl (c)	52	30	—	—	9	Ppt.	2	Sol.
Polytheylene Glycols								
Diethylene (a)	53	30	—	—	8	Ppt.	2	Sol.
Triethylene (a)	75	32	—	—	9	Ppt.	2	Sol.
"Carbowax" 300 (a)	150	36	2	Sol.	2	Sol.	—	—
Polypropylene Glycols								
Dipropylene (a)	67	31	—	—	8	Ppt.	4	Sol.
Tripropylene (d)	96	33	3	Sol.	8	Ppt.	—	—
PPG 425 (a)	212	40	6	Sol.	5	Sol.	—	—
PPG 1025 (a)	550	55	10	Sol.	6	Sol.	6	Sol.
"Pluronic" L31 (e)	524	54	7	Sol.	5	Ppt.	—	—
PPG 2025 (a)	1,000	65	—	—	6	Sol.	—	—
"Pluronic" L61 (e)	1,000	65	3	Sol.	2	Sol.	—	—
Cyclic Glycols								
Dow Resin X-2635 (d)	180	39	5	Sol.	3	Sol.	4	Sol.
Dow Resin 565 (d)	200	39	8	Sol.	—	—	—	—
Dow Resin X-2662 (d)	146	36	5	Ppt.	24	Ppt.	2	Sol.
"Droxol" B (f)	310	45	3	Sol.	5	Sol.	—	—

Notes: (a) Union Carbide Chemicals Co.; PPG = polypropylene glycol
(b) General Aniline and Film Corp.
(c) Eastman Chemical Products, Inc.
(d) Dow Chemical Co.
(e) Wyandotte Chemicals Corp.
(f) Nopco Chemical Co.

were as follows: MEK, 0.15%; other solvents, 0.05% or less. In general, the water content of the solvent should be as low as practicable to minimize the hydrolysis of anhydride groups. Therefore, for an application which requires an adduct solution in a low-boiling solvent, MEK is the preferred solvent rather than acetone. Of course, the use of alcohol solvents was avoided throughout all of this work, due to the danger of reactivity with anhydride groups.

Nineteen glycols were screened. They are classified in Table I as (1) aliphatic glycols, (2) polyethylene glycols, (3) polypropylene glycols, and (4) glycols containing a cyclic structure. The average molecular weights of resinous glycols were determined before use by reaction with phthalic anhydride-pyridine reagent (Reference 4).

Results and Discussion. Eighteen of the reactant glycols produced adducts soluble in one or more of the solvents tested the concentration of adduct in solution varied from 28 to 65%, depending upon the molecular weight of the glycol tested. Table I contains details about the specific glycol-solvent combinations. The successful development of these adduct solutions has provided new opportunities for utilizing PMDA in coating, laminating, and adhesive applications.

The adduct solutions have been characterized by titration analysis for anhydride groups and carboxylic acid groups (Reference 3). When ordinary precautions were taken to exclude moisture, the anhydride content of an adduct solution was 80-95% of theory. Typical analyses are given in Table II.

The standard glycol adopted for adduct preparation was 2,2-bis[4-(2-hydroxyethoxy)phenyl] propane, which is available from the Dow Chemical Company as Dow Resin X-2635. The fact that this glycol is a derivative of bisphenol A was taken as some assurance that the glycol component would not alter the performance of cured epoxy resins of the bisphenol A type. The preparation of PMDA-Dow Resin X-2635 adduct solutions suitable for coating work (40% solids in MIBK/MEK at a ratio of 9/1) and for laminating or adhesives work (55% solids in MEK) is outlined in Table II. The performance of other glycols was compared to this standard glycol in order

TABLE II

ANALYSIS OF PMDA-GLYCOL ADDUCTS

(Molar Ratio of PMDA to glycol = 1.0 to 0.55)

Charge (parts by weight)	A*	B*	C*
PMDA	218	218	218
Dow X-2635 (Dow Chemical)	180	—	—
PPG 1025 (Union Carbide)	—	550	—
"Droxol" X (Nopco Chemical	—	—	380
MEK	330	70	402
MIBK	—	698	—
Total	728	1536	1000
% Solids	55	50	55
Analysis (equiv. per kg.)			
Anhydride	1.29	0.50	0.82
Carboxyl	1.50	0.83	1.18
Total	2.79	1.33	2.00
Theoretical equiv. per kg. (a)			
Anhydride	1.38	0.65	1.00
Carboxyl	1.38	0.65	1.00
Total	2.76	1.30	2.00

*Samples of Adducts A, B, and C are available from Chemical Sales, Explosives Dept., E. I. du Pont de Nemours & Co., Wilmington 98, Del.

Note: (a) Calculation based on compound (I) of Figure 1

TABLE III

EPOXY RESINS INVESTIGATED

Designation Used Herein	Reactants (a)	Epoxide Equiv.	Source
1. BPA-190	BPA; E	190	Several
2. BPA-490	BPA; E	490	Several
3. BPA-950	BPA; E	950	Several
4. BPA-2175	BPA; E	2175	Several
5. "Epon" 1031	Phenol; glyoxal; E	200	Shell Chemical Co.
6. Dow Epoxy Novolac 438	Novolac; E	178	Dow Chemical Co.
7. Resin EP-201	Cyclohexene oxide deriv.	140	Union Carbide Corp.
8. "Epon" 812 (562)	Glycerol; E	152	Shell Chemical Co.
9. RD-2	Butanediol; E	133	Ciba Products Corp.
10. PAGE	Poly(allyl glycidyl ether)	140	Shell Chemical Co.

Note: (a) E = epichlorohydrin
BPA = bisphenol A

to determine the effect of structural changes of the glycol component on the performance of the cured resin.

Evaluation of Coatings Baked at 300°F.

Experimental. The objective at this stage was the development of a PMDA-cured coating system that would possess a useful balance of properties after a cure of 30 minutes or less at 300°F. A solution of PMDA-Dow Resin X-2635 adduct was used as the standard curing agent (Table II, Solution A). Solutions of various solid epoxy resins based on bisphenol A were prepared, so that the final formulation was made up to 25% solids in a solvent blend of "Cellosolve" acetate/MIBK/xylene (3/2/1). Certain flow control agents and wetting agents were added, as discussed below. The standard substrate selected for this work was "Bonderite" 1000-treated, cold-rolled steel (Parker Rustproof Company). Coatings of 0.5 to 1.0 mil thickness were applied by a blade applicator or by a spray gun technique. The coated panels were air dried for 15 minutes and baked for 30 minutes at 300°F. in an air-circulating oven, unless otherwise noted. For convenience, this cure is referred to as "the standard cure."

The following tests for coatings were run:

1. Pencil hardness (Eagle Pencil Company pencils)
2. Mandrel flexibility
3. Impact resistance (Du Pont-Parlin Tester)
4. Reverse impact
5. Adhesion: Cross-hatched cuts were made 1/16th inch apart on the film by a razor; "Scotch" tape was applied to the area and pulled off at a rapid rate; the film was examined for lifting between cuts.
6. MEK resistance: Coated panels were soaked in MEK for 5 minutes, withdrawn, and quickly tested for pencil hardness.
7. Boiling water resistance: Coated panels were immersed in boiling water for 5 minutes, withdrawn, and quickly tested for pencil hardness. Also, appearance was noted.

For the purposes of this paper, a coating was said to possess a satisfactory balance of properties if pencil hardness was 8H; flexibility passed 1/8 inch mandrel bend; impact and reverse impact were greater than 80-inch-pounds; adhesion test showed no lifting

TABLE IV

STUDY OF RATIO OF INGREDIENTS

	Epoxy Resin	Equiv. Ratio E/A/OH (a)	Modifier (b) (% of solids)	Bake Time at 300°F. (min.)	Performance
1.	BPA-490 BPA-2175 (85/15)	1.05/1.0/0.5	None	30	Poor MEK resistance
			2% R	30	Satisfactory balance
			5% R (c)	15 (c)	Satisfactory balance
			5% U	20	Satisfactory balance
2.	BPA-950	1.05/1.0/0.5	5% R	20	Satisfactory balance
			5% U	30	Satisfactory balance
3.	BPA-490	1.05/1.0/0.5	5% R	30	Brittle; passed ¼' 'mandrel
			5% U	30	Brittle; passed ¼" mandrel
4.	BPA-490 BPA-2175 (85/15)	1.2/1.0/0.5	5% R	25	Satisfactory balance
5.	BPA-490 BPA-2175 (85/15)	0.85/1.0/0.5	5% R	20	Satisfactory balance

Notes: (a) E/A/OH =epoxide/anhydride/glycol hydroxyl
(b) R ="Resimene" 882; U ="Uformite" F240N
(c) This formulation produced a satisfactory balance of properties, as defined in the text, in the shortest bake time of any of the formulations studied here. For the detailed preparation of this formulation, see Table V, Formulation E.

of the film; MEK test showed no softening of film; and boiling water test showed no softening of film nor change in appearance. Prolonged chemical resistance tests were run on those coatings which possessed a satisfactory balance of properties.

Results and Discussion. The preferred formulation developed in this work contained PMDA-Dow Resin X-2635 adduct, a blend of resins BPA-490 and BPA-2175, and "Resimene" 882 as modifying agent (Table V). (See Table III for explanation of resin codes.) When a 25% solids solution of this formulation was used, the minimum cure schedule required to attain a satisfactory balance of properties was 15 minutes at 300°F. or 4 minutes at 400F°. The shelf life of the formulation is greater than sixty days. Adhesion to untreated aluminum, cold-rolled steel, stainless steel, and tin plate was excellent. Data on solvent resistance and abrasion resistance are presented in Table VI. The resistance of the coating to attack by mineral acid, glacial acetic acid, and boiling water was exceptionally good.

TABLE V

Preferred Formulations

INGREDIENTS	E	F
Bisphenol-A based epoxy resins		
Epoxide equiv. 500	175	—
Epoxide equiv. 950	—	200
Epoxide equiv. 1850	25	—
PMDA Adduct A (Table II)	125	42
Modifiers		
"Resimene" 882 (Monsanto Chemical)	15	—
Polyol X-450 (Shell Chemical)	—	12
SR-82 (General Electric	2	1
"Tipure" R510 or T610 (DuPont Co.)	110	235
"Cellosolve" Acetate	90	90
MIBK	90	90
Ball milled these ingredients overnight		
Then added the following let down:		
"Cellosolve" Acetate	90	90
Xylol	180	90
Toluol	60	90
MEK	38	60
	1000	1000
VEHICLE CONSTANTS		
Total Solids	40%	47%
Weight/gallon	8.7 lb.	8.7 lb.
Pigment/binder	0.4	1.0
Viscosity, No. 2 Zahn cup	19 sec.	22 sec.
Approx. Pot Life	2 months	12 months

Results on formulations containing various ratios of ingredients are given in Table IV and may be summarized as follows: (1) The near optimum ratio of epoxide/anhydride/glycol hydroxyl equivalents was found to be 1.05/1.0/0.5. (2) The addition of a melamine-formaldehyde resin ("Resimene" 882, Monsanto Chemical Company) was found to act both as a flow control agent and as a catalyst. (3) The amino resin was added preferably at 5% of solids in the formulation.

When epoxy resin BPA-490 was used under standard conditions (equivalent ratio stated above; amino resin, 5% of solids; and standard cure) somewhat brittle films developed. When resin BPA-950 was used under these conditions, coatings with a satisfactory balance of properties were obtained. When resin BPA-490 was blended with resin BPA-2175 at an 85/15 weight ratio, coatings with a satisfactory balance of properties were obtained. A choice between the two formulations given in Table V would depend upon detailed evaluation for a given application.

Extreme Flexibility. Variation of the glycol component in the epoxy-PMDA-glycol coating system is a possible approach toward obtaining certain unique properties in an epoxy film. For example, one objective was the development of an epoxy coating that would withstand post-forming operations on metal.

TABLE VI

DETAILED PERFORMANCE TESTS

Formulation: E of Table V; SR82 omitted
Substrate: "Bonderite" 1000 treated, cold-rolled steel
Thickness: 0.5-1.0 mil
Bake: 30 min. at 300°F.

I. Solvent Resistance

Chemical	Temperature (°F.)	Time (days)	Appearance	Pencil Hardness (b)
10% H_2SO_4	125	150	Unchanged (a)	8H
Distilled H_2O	125	150	Unchanged	8H
Distilled H_2O	212	4	Unchanged	6H
MEK	Room	150	Unchanged	8H
MEK	175	12	Unchanged	6H
Glacial Acetic Acid	Room	7	Unchanged	4H
10% NaOH	125	1	Spots	8H
		4	Spots	3B
3% NaOH	Room	150	Unchanged	8H

Notes: (a) Substrate was untreated stainless steel.
(b) After exposure, the panels were washed, dried, and allowed to stand at room temperature for 10 minutes before pencil hardness was determined.

II. Taber Abrasion Test (CS-17 wheel, 1000 g. total load)

Cycles	Loss In Wt. (mg.)
250	0.5
1000	8.0

TABLE VII

EVALUATION OF COATINGS CURED AT 200°F. AND ROOM TEMPERATURE

(See text for definitions of tests)

Epoxy Resin	Equiv. Ratio E/A/OH (a)	Modifier (b) (% of solids)	Cure	Solvent Resistance MEK	Solvent Resistance H_2O	Mandrel (in.)	Reverse Impact (in.-lb.)
Diepoxides							
"Epon" 812 (562)	1.0/1.0/0.5	5% R	A	8H	B	pass 1/8	75+
			B	8H	8H	pass 1/8	75+
	1.0/0.6/0.3	5% R	D	8H	B	pass 1/8	75+
EP201	1.0/0.8/0.4	5% R	A	6H	B	pass 1/4	<15
			B	8H	8H	pass 1/8	<15
BPA-490	1.0/1.0/0.5	5% U	B	<B	2H	pass 3/4	<15
BPA-190	1.0/0.8/0.4	5% U	B	<B	3H	fail 1	<15
RD-2	1.0/0.8/0.4	5% U	B	<B	HB	pass 1/8	75+
Polyepoxides							
PAGE	1.0/0.6/0.3	none	A	8H	3H	pass 1/8	75+
		none	B	8H	6H	pass 3/4	<15
	1.0/0.7/0.35	5% U	C	8H	HB	pass 1/8	—
		5% U	D	8H	5H	pass 1/8	75+
"Epon" 1031	1.0/0.8/0.4	none	A	8H	2H	pass 3/4	—
Epoxy Novolac 438	1.0/0.6/0.3	5% U	A	<B	7H	pass 3/4	<15
			B	8H	7H	pass 3/4	<15
			D	8H	H	pass 1/8	60

Cure A — 200°F. x 20 minutes
B — 200°F. x 60 minutes
C — 75°F. x 3 days
D — 75°F. x 7 days

Notes: (a) E/A/OH = epoxide/anhydride/glycol hydroxyl equiv. ratio
(b) R = "Resimene" 882; U = "Uformite" F240-N

In order to evaluate this feature, coated panels were bent through a 180° angle and flattened on a sheet-metal brake, then inspected for film failure. In order to introduce the necessary elongation into the film, polypropylene glycols of various molecular weights were used as the glycol component. The formulations involved the optimum equivalent ratio stated above; "Uformite" F24ON (Rohm and Haas Company) 2% of solids; and a standard cure. Films based on tripropylene glycol and polypropylene glycol with an average molecular weight of 425 failed to pass this test. When the average molecular weight of the polypropylene glycol was raised to 1080, the cured film had sufficient elongation to survive the post-forming test. This film had relatively poor resistance to MEK, but resistance to MIBK was satisfactory. This technique of copolymerizing epoxy resins of various structures and glycols of various structures with the aid of PMDA opens up numerous combinations of

(*Turn to page 92*)

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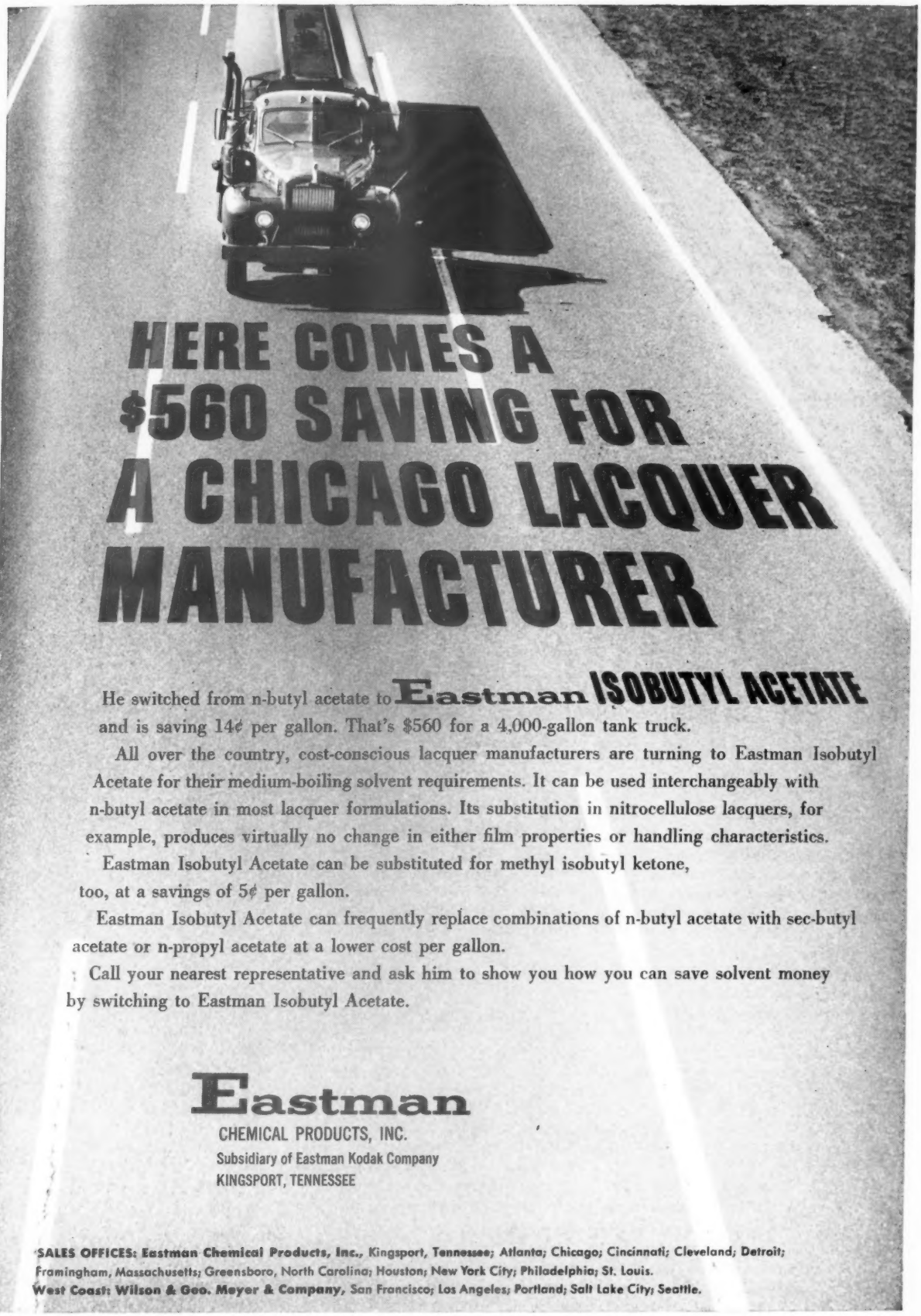

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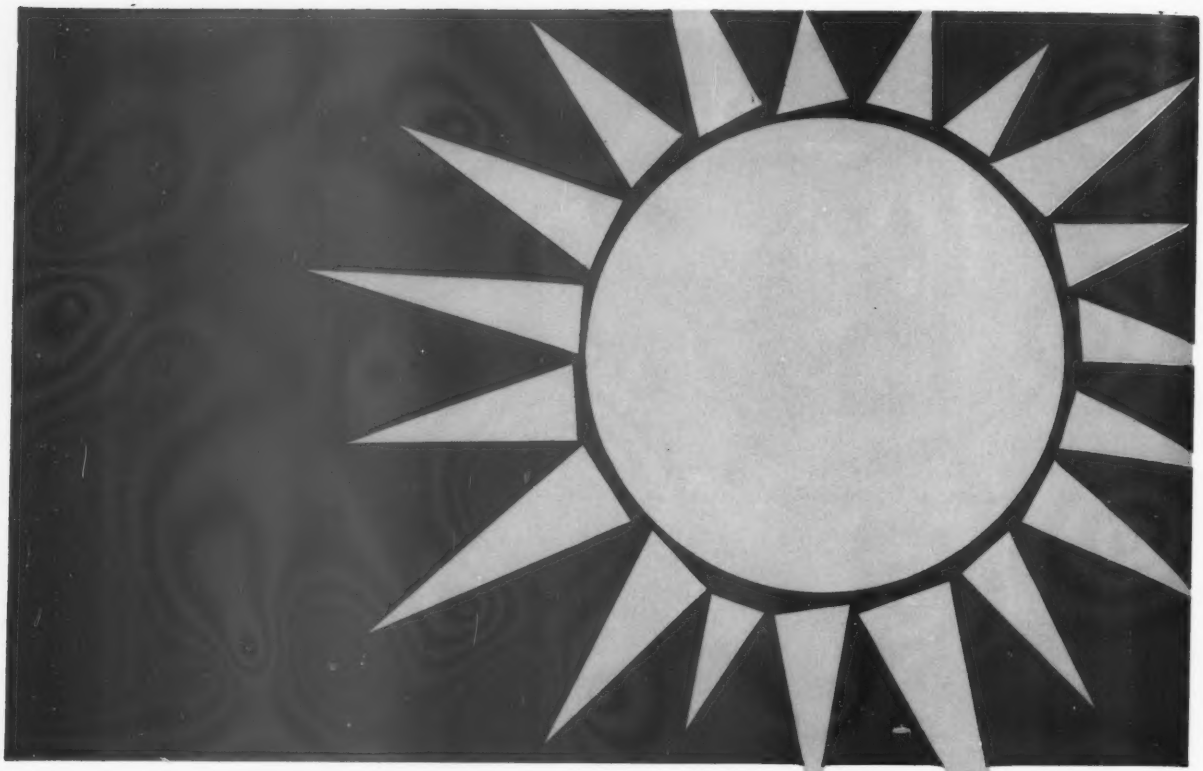

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MIBK	186
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Xylol	69
Cellosolve	38
Isophorone	4.3

Flash Points (°F Tag Open Cup) of 2-NP Compared to Other Solvents

Acetone	16
MEK	30
Toluol	56
MIBK	81
Xylol	85
n-Butyl Acetate	92
2-NP	103
Cellosolve	126
Isophorone	202

Comparison of Lower Limit of Flammability of 2-NP With Other Solvents (% by volume in air)

MIBK	0.9
Xylol	1.0
Toluol	1.27
n-Butyl Acetate	1.7
MEK	1.8
Acetone	2.15
2-Nitropropane	2.6
Cellosolve	2.6

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NEW APPROACH TO HIDING POWER IN LATEX PAINTS

New extender pigments in combination with TiO_2 produces higher hiding power greater than obtained from a purely additive basis.

By
R. R. Browning, Jr.*

HIDING power at low cost is most important in emulsion paint systems today. A prime pigment such as pure titanium dioxide is used to impart this necessary hiding power. Extender pigments usually are specified for other reasons such as cost and to impart or retain certain properties needed to make these paints serviceable and durable. The paint technologist strives constantly to enhance these properties at no extra cost—or to retain the properties at lower cost.

In paints, as in many other industries where the dispersion of pigment is a factor, energy has to be applied to obtain desirable results. The type of equipment used influences the degree of dispersion and the viscosity of the vehicle employed affects the ease of dispersion. It has been found, however, that dry pigments differ in their resistance to dispersion. Water has such a low viscosity that it can produce an important shear only when violently agitated, or when the viscosity of the system is increased by high pigment loading. The cohesive forces which resist dispersion in pigments are strong in titanium dioxide and zinc oxide, but quite weak in clays and talcs. Calcium carbonate is intermediate in this respect. Chemical dispersing or deflocculating agents act on pigment surfaces to help reduce the interparticle forces which retard free particle movement. The dispersion of pigments in aqueous systems has thus generally been accomplished by the combined effect of chemical treatment and mechanical shear. If it were possible to improve the dispersion of titanium dioxide beyond these known methods, it would be expected that higher opacity would result.

It is the purpose of this paper to describe a new pigment and its efficiency, particularly as revealed optically, when used as an aid to disperse rutile TiO_2 in a water system.

Background

Not quite ten years ago we produced the first of a new series of synthetic pigments, trademarked "Zeolex." This first one was designed as a reinforcing pigment in rubber compounding. Other grades have since been developed which are paper pigments, carriers for insecticides, and anticaking or conditioning agents for table salt and many other food and chemical products which tend to stick together.

The Zeolex group of pigments are sodium silico-aluminates and are prepared by reacting aluminum salts with alkali silicates. The precipitate slurry is filtered, washed, wet-ground, spray-dried, and finally dry-ground and classified to 99.9% through a 325 mesh screen. Extensive programming and instrumentation are employed at each stage to carefully control the critical factors of time, temperature, pressure, concentration, pH and viscosity. Through these reaction controls it is possible to produce different Zeolexes with different properties. Thus, a series of pigments are made, each designed for a specific use.

Paint Pigment

The paper industry uses water as the vehicle; their major pigment is kaolin clay, with considerable tonnages of precipitated calcium carbonate and titanium dioxide also employed where greater whiteness and opacity are needed. These

*J. M. Huber Corp., New York, N. Y.

TABLE I

POLYVINYL ACETATE EMULSION PAINT (Ball Mill Grind)

Formula (Pigments & Polymer Emulsion only)		Control	Zeolex 80
Titanium (Rutile)		200	175
Z eolex 80		—	12.5
Silica, amorphous		50	50
Whiting		150	150
PVA Emulsion (55%)		330	330
Total lbs./100 gal.		1143	1130.5
PVC, %		42	42
Opacity		Equal	
Cost Savings/100 gal.		$ 0.00	$ 5.25
Test Data			
Viscosity	- Initial KU	68	69
	- 2 months	80	82
	- Change	—	—
		12	13
pH	- Initial	7.30	7.30
	- 4 months	7.10	7.30
	- Change	−0.20	0.00
Sheen		4	3
Reflectance		88.4	88.4
Opacity		93.8	93.8
Gloss	- Standard	72	72
	- Sealed Area	67	69
	- Porous Area	66	72
	- Max. Drop	6	3
Stain Removal			
Pencil, cycles		29	15
Crayon, "		64	61
Grease, "		5	5
Scrub Resistance			
Reflectance-Initial		84.0	83.7
	- 200 cycles	82.9	83.0
	- Change	−1.1	−0.7
Burnish Resistance			
Sheen	- Initial	4	3
	- 200 cycles	20	19
	- Change	16	16
Color Development (2% blue)		9	9

pigments are dispersed in water, and binders added—all quite similar at this point to the production of latex paints. One of the Zeolex pigments has made significant contributions to the optical properties of certain grades of paper.

This led us to a study of the hiding properties of Zeolex—titanium dioxide mixtures in paints with the specific task of creating a new paint pigment. Following our own evaluations, the best of the experimental pigments was tested by an independent, well known paint laboratory. The program included comparisons of our experimental pigment with calcined clays and a synthetic calcium silicate derived from diatomite as partial replacements for titanium. Table I contains part of this program, a PVA paint with 25 parts of titanium replaced by 12½ parts of Zeolex pigment; opacity is equal, there is a saving of $5.25 per 100 gallons, and it is noted that all paint properties are equal to standard or somewhat better. The Zeolex pigment was generally superior to the other pigments tested.

The next step was to determine the reproducibility of this experimental pigment and the factors to be controlled to retain desired properties. Achieving this, we now had the pigment designated as Zeolex 80, a tailor-made product to do a specific job. We built into Zeolex 80 a neutral pH. We felt this property was a necessary safeguard to provide better viscosity stability than found with the usually acid or alkaline extenders. We wanted a high brightness pigment with a G. E. Reflectance value of over 90%. This pigment runs about 93%. It was believed very high oil and water absorption would be a drawback, but a particle size of about 1/10th that of TiO_2 was necessary for efficient separation of the TiO_2 particles. TiO_2 appears most efficient at a mean particle diameter of .2 microns. Thus we produced a mean particle size of .02 microns with little or no pore structure. Oil absorption was therefore kept down to 135 gms. per 100 gms. versus three times this for some synthetic silicas. Bulking value is 17.5 pounds per gallon.

Another well known paint laboratory was chosen to re-evaluate Zeolex 80, for two reasons—an extra point of view, and to be sure that production lots of this pigment were equal to the experimental pigment. In this program PVA, styrene-butadiene, and acrylic paints were to be made; the PVA work is completed, while the others are nearing completion, with some initial data available from the styrene-butadiene program.

Table II shows a PVA paint with high Pigment Volume Concentration, the control containing 50 parts of diatomaceous silica which is replaced with 50 parts of Zeolex 80 in the test paint; all other ingredients identical. The Zeolex 80 paint shows marked improvement in reflectances and contrast ratio, while maintaining all other paint properties. Thus, this particular pigment is more effective than diatomaceous silica in obtaining good optical properties.

Using this same PVA formula, another series of test paints were prepared with Zeolex 80 being used in increasing amounts to replace equivalent amounts of titanium, up to 40% replacement. In Table III we see that maximum optical properties are reached at between 10 and 20% substitution of Zeolex 80 for titanium, with cost savings of between $2.50 and $4.50 per 100 gallons of paint. It also noted that savings of close to $7.00 per 100 gallons can be achieved at the same optical properties as the control paint. With this direct pound for pound substitution there is naturally a slight increase in PVC and decrease in paint density.

On the styrene-butadiene paints, stability tests are not yet completed, but optical properties and

FIGURE 1 · REPLACEMENT OF TiO_2 BY ZEOLEX 80 IN STYR-BUTA PAINT

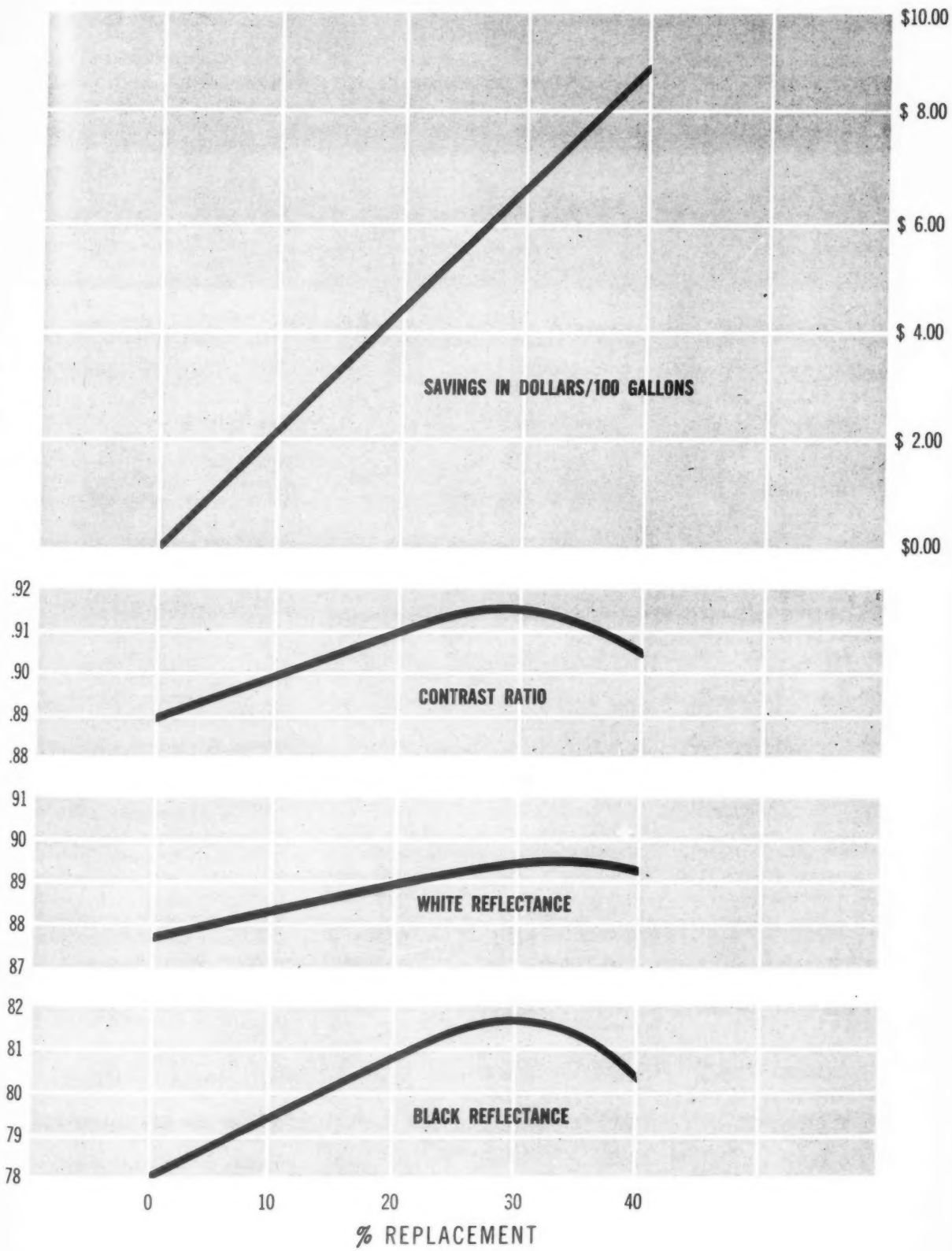


TABLE II

POLYVINYL ACETATE EMULSION PAINT (Ball Mill Grind)

Formula	Control	Zeolex 80
Titanium (Rutile)	175	175
Diatomaceous Silica	50	—
Zeolex 80	—	50
Huber 35 kaolin	200	200
Whiting	100	100
PVA Emulsion (55%)	175	175
Total lbs./100 gal.	1190	1190
PVC, %	65	65
Test Data		
Black Reflectance, %	86.45	91.0
White " %	90.40	92.1
Contrast Ratio	.957	.988
Density, lbs./gal.	11.90	11.88
Viscosity, KU, - 1 month	84	78
- 2 months	84	78
- 3 months	84	78
Freeze-Thaw Stability		
- 5 cycles	OK	OK
Gloss, % Reflection	12	12
Dry Set, Minutes	90	90
Washability	Equal	
Scuff Resistance	"	
Scrubability	"	
Stain Removal	"	
Flexing	"	
Tint Holdout	"	
Settling	"	

TABLE III

POLYVINYL ACETATE EMULSION PAINT (Ball Mill Grind)

Formula	Control	Zeolex 80			
% Replacement	0	10	20	30	40
Titanium (Rutile)	175	157.5	140	122.5	105
Zeolex 80	0	17.5	35	52.5	70
Diatomaceous Silica	50	50	50	50	50
Huber 35 kaolin	200	200	200	200	200
Whiting	100	100	100	100	100
PVA Emulsion (55%)	175	175	175	175	175
Total lbs./100 gal.	1190				
Density, lbs./gal.	11.9	11.84	11.78	11.72	11.66
PVC, %	65				66.5
Cost Savings/100 gal.	$ 0.00	$ 2.34	$ 4.68	$ 7.02	$ 9.45
Optical Data					
Black Reflectance, %	86.4	87.9	86.7	86.0	83.6
White Reflectance, %	90.4	91.8	90.6	90.0	89.2
Contrast Ratio	.957	.958	.958	.956	.938

TABLE IV

STYRENE-BUTADIENE LATEX PAINT (Ball Mill Grind)

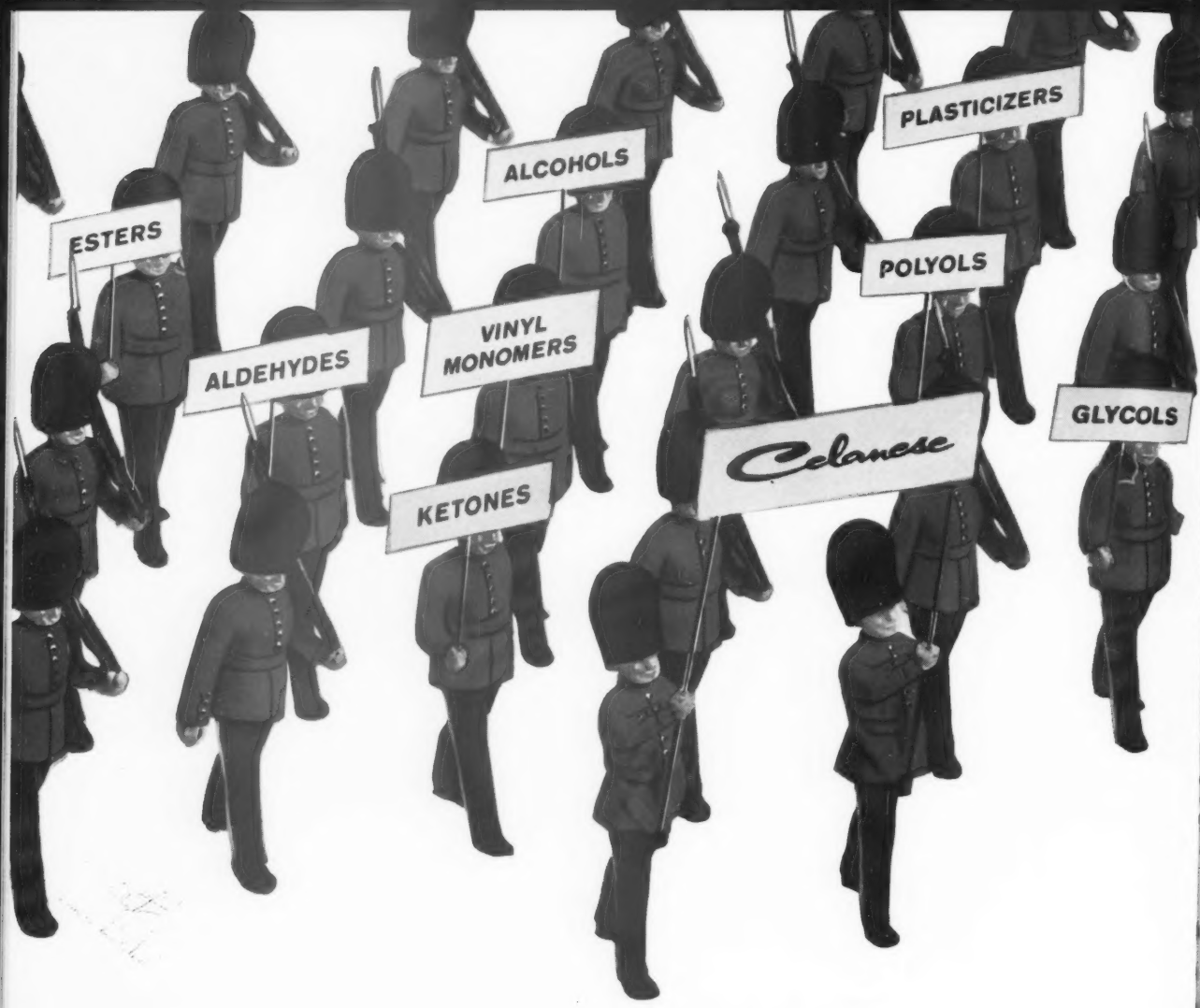
Formula	Control	Zeolex 80			
% Replacement	0	10	20	30	40
Titanium (Rutile)	165	148.5	132	115.5	99
Zeolex 80	0	16.5	33	49.5	66
Diatomaceous Silica	47	47	47	47	47
Huber 35 kaolin	188	188	188	188	188
Whiting	94	94	94	94	94
Sty-Buta Emulsion (48%)	197	197	197	197	197
Total lbs./100 gal.	1162				
Density, lbs./gal.	11.62	11.57	11.52	11.47	11.42
PVC, %	60				62
Cost Savings/100 gal.	$ 0.00	$ 2.22	$ 4.45	$ 6.68	$ 8.90
Optical Data					
Black Reflectance, %	78.0	79.55	80.90	81.60	80.6
White Reflectance, %	87.8	88.30	88.90	89.30	89.20
Contrast Ratio	0.888	0.900	0.911	0.914	0.903

corresponding cost data can be illustrated here. Table IV shows these values. It is seen that maximum contrast ratio is achieved at about a 30% replacement level with saving of over $6.50 per 100 gallons. At the 40% level, reflectances and contrast ratio are still considerably higher than the control paint, with cost reduction of 9c per gallon. Figure I is a graphic presentation of these data. As with the direct substitution in PVA paint of Table III, this styrene-butadiene paint formula of 60% PVC is increased to about 62% at the 40% replacement level.

Conclusions

When used in emulsion paints the new pigment promotes a better utilization of pure titanium dioxide. It is capable of producing higher optical properties than are attained with other extender pigments. In combination with TiO_2, it produces hiding power greater than may be expected from a purely additive basis. It does this to a greater degree than do diatomaceous silicas and their reaction products, or calcined clays. One theory as to just why Zeolex 80 does this is that this new and unique material combines just the right properties to coat or condition the TiO_2 so that the tendency of this prime pigment to reagglomerate after removal of dispersion energy is reduced.

The very large number of Zeolex 80 particles separate the bigger TiO_2 particles, thus achieving more efficient dispersion. The high reractive index of titanium is brought to a more complete utilization. This optical improvement is obtained without adversely affecting other paint properties. Viscosity stability, washability, scuff resistance, scrub resistance, stain removal, adhesion, flex, gloss, settling, freeze-thaw stability and tint holdout are equal to or better than the control paint without Zeolex 80. Since this pigment is about half the price of titanium dioxide, and has a density about half that of TiO_2, savings over present formulation costs can be obtained without sacrifice of quality. Zeolex 80 incorporates easily into emulsion paints—it is handled just like any other wettable pigment.



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DON'T MURDER YOUR BUSINESS

By
Irving Elbaum*

MOST businesses do not die natural deaths. Their managements kill them! Whether the business firm is a sole proprietorship, a partnership or a corporation doesn't seem to matter. The blunt, the inescapable fact is that homicide, accidental though it may be in many cases, is committed. And there are various murder techniques.

There seems to be a popular misconception regarding the ease with which the life of a paint and/or varnish plant can be sustained. There is very little doubt that sustaining life is any business, be it large or small, is a tough job, particularly during the present stage in our economy. There are as many economic indices on the side of the optimists as there are on the gloomier side. Uncertainty is the one certain note facing us today.

Superimposed on this general business difficulty is the hardship faced by the small operator. After all, consider his position. His business is usually not too well capitalized, is not as well controlled as a larger operation, generally faces shortages of working capital constantly, and receives a tighter credit line than its larger competitors. What is really comes down to in the final analysis is this: the advantage of having everything under the thumb of the owner is more than offset by the disadvantages which are concommitant with smallness—inadequate financial reserves and difficulty in decentralizing responsibilities among subordinates.

Why Failures Occur

Let's delve into some figures concerning business failures. A survey made by Dun & Bradstreet indicated that only 78 out of every 10,000 businesses fail. This is truly amazing in light of the fact that many new businessmen have had little or no prior business experience. Incidentally, this statistic covered a period of fifty years and therefore can be considered to be extremely reliable. Naturally, there have been wide variations depending on the particular stage through which the economy was passing. Still this very low mortality rate should encourage every small paint and/or varnish man.

Another Dun & Bradstreet survey showed that two out of every three concerns that failed had been in business for five years or less. This isn't surprising. Yet it should gladden the hearts of those among you who are over the five-year hump. No guarantee, of course, that it couldn't happen to you, but it is nice to know that the figures are on your side. Currently, failures are on the uptrend and even though the serious level has not been approached the entire problem bears close watching.

Just what are the basic, the broad reasons that businesses die? A study of 9,162 failures came up with the following reasons (listed in the order of importance):

Incompetence	42%
Lack of business experience	31%
Lack of rounded experience	14%
Neglect	6%
Fraud of the owners	4%
Miscellaneous	3%
	100%

Analysis of Failure Causes

Let us examine each group to learn something about it and to learn, where possible, what can be done to control some of the controllable factors.

Incompetence: Generally speaking, this group can be broken down into three categories: physical, emotional and economic. It must be recognized at the outset that of necessity there are overlaps and vicious cycles among these groups. It is quite evident that what begins as an economic type of incompetence can soon become emotional and even end up as physical incompetence.

Physical incompetence is represented by an individual who cannot take the long hours or the heavy work necessitated by the business. It occurs not too often, yet it can easily get you down after a short while. The antidotes would seem to be selling the business before it dies on you, transferring the heavy duties to an employee (if possible), renting or buying labor-saving devices, and having a close relative help you with some of the administrative details.

Emotional incompetence is a very common reason for the failure of many businesses. Many a man's personality is such that he is an excellent worker, but cannot stand the responsibility that heading even a small business brings. It is only common sense that before someone goes into business he should ask and answer the following questions (among others) with all the sincerity he can:

Do I realize that I may lose money and that I'll be in a rough spot pretty often?

Can I take the responsibility of paying my creditors and my workers on time?

Will I mind working long hours?

Do I care for this type of business?

Am I ingenious enough to get myself out of a tight financial spot quickly?

With economic incompetence the largest factor is inadequate initial capital. The wise man who is thinking of going into a small operation should take time out to make a fairly accurate calculation as to his financial needs to keep the business going for at least a year. Unfortunately, it has been my experience that far too many people start on the proverbial shoestring. They feel that once the initial outlay for machinery, furniture, fixtures, deposits, licenses, merchandise, supplies, etc. is made, things will take care of themselves. Such could not be further from the truth.

*Certified Public Accountant, Los Angeles, Calif.

It is most vital to prepare a simple, yet accurate, budget before the business is begun. This should show the estimated amount of cash needed not only to acquire the items mentioned above, but also to meet payrolls, overhead and to carry those customers who are not on a cash basis. One doesn't have to be a C.P.A. to prepare this simple calculation, yet it is so important for survival in our competitive economy.

I venture to say that at least half of all new smaller businesses are begun without making this type of calculation. Of course, this does not mean that, barring the preparation of this budget, failure is inevitable. Yet there can be no doubt in the mind of any prudent person that the elimination of this simple device is tantamount to having two strikes called.

One more point—it isn't absolutely necessary that the budget be reduced to written form. The important thing is that it be taken into consideration before the business venture is begun.

Lack of business experience: This covers lack of experience in business in general as well as in the particular line. The remedies will be suggested in many cases by reviewing the following list of typical symptoms of this illness: (1) No, or inadequate, records. (2) Overextension of credit. (3) Poor receivable collections. (4) Taking on too large a fixed overhead. (5) Not reducing the variable overhead when the going gets rough. (6) Overbuying or underbuying. (7) Poor location. (8) Not knowing how to combat competition. (9) Not knowing this business.

Lack of rounded experience: This defect reflects itself in the technique of favoring one department of the company to almost a complete exclusion of the others. Former salesmen generally are the greatest violators. They have become so accustomed to seeing business through sales lenses that they find it very hard to place purchasing, credits, collections, etc. in their proper positions on the business scale.

Where a partnership exists the problem of rounded experience is usually not as acute as it is in the case of many sole proprietorships, since each partner makes his own experience contribution and, what is just as important, can act as a sounding board for his partner.

It is a wise idea to make use of the firm's accountant, since his varied experience can prove invaluable in showing the owner(s) the forest rather than the individual trees. In the last analysis the financial statements of the enterprise will prove most significant in highlighting any distortions that are occurring due to misplaced emphasis on some of the departments of the firm.

Another method of offsetting the disadvantage of lack of rounded experience is to draw on the experience of others in your industry via trade periodicals, attending industry conferences, belonging to a trade association, etc.

Neglect: This is generally due to: (1) Poor personal habits. (2) Poor health. (3) Domestic difficulties. Some of these foibles are difficult, others impossible to eradicate. A logical view commands the owner to decide whether the difficulty is surmountable or not. If not, discretion should indicate that it might be wise to sell the business rather than ruin it. In some instances, such as a temporary health deficiency, it is advisable to turn over the running of the firm to a trusted employee or a close relative, or both, for a short while.

Fraud of the owners: This is symptomized by false financial statements, illegal disposition of assets, deliberate overbuying. Luckily for the business community this group represents only a small percentage of the total failures.

Miscellaneous: This covers such items as employee frauds, disasters and unknown reasons for failure. employee frauds and such disasters as fire, burglary, boiler explosion, etc., can be protected against at reasonable cost. The advice of an insurance broker should be sought not only at the inception of a business but on a continuing basis. All too often a business is adequately covered for various types of risks when it begins, but with maturity there is sometimes a tendency to let the insurance program remain static. Obviously, business is dynamic and it therefore follows that an insurance program covering its risks should change from time to time. Even in a small unit it is a smart thought to review the insurance coverages every month or two.

Awareness of the causes of failure can go a long way toward preventing failure. Action can go a longer way. The following list, by no means exhaustive, should give you action ideas sufficient to prevent you from killing the source of your food, clothing and shelter.

(1) Join a trade association.
(2) Read as many trade journals as you can.
(3) Question suppliers and their salesmen about new developments.
(4) Talk to your attorney, accountant, banker and insurance man about those phases of your business which come within their jurisdiction.
(5) If you have a partner, discuss all phases of the business with him regularly. Remember, you're married to him commercially.
(6) See your doctor if you're chronically tired. If you're not, have an annual checkup anyway.
(7) Keep accurate, up-to-the-minute records.
(8) Review your list of receivables regularly and often. Keep after the slow ones. Be polite but firm.
(9) Digest your financial statements. Remember, they are not novels to be skimmed through. One item that your hurried eye misses may well mean the difference between success and failure over the long pull.
(10) If, as and when things look hopeless don't commit any fraudulent act. You may regret it the rest of your life. Discuss your apparently insoluble problem with the proper professional man. He'll steer you straight.
(11) Don't listen to the army of armchair generals. Many people delight in giving business advice, unasked for though it may be.

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By
Edward Anthony

The author expresses his random reflections on various aspects of the paint industry. The opinions contained in this column are his alone and do not necessarily reflect those of this publication.

The Future Is Here

THE tremendously broadened spectrum of polymers which has been made commercially available for processing into consumer goods in increasing quality and quantity over the past three to four decades, has opened almost untold new consumption and marketing methods, patterns, and standards. Whole new industries are based on these developments; others have undergone technological revolutions. While the final consumer products differ greatly in appearance and usage it would be difficult, if not impossible, to separate the science and technology responsible for each of the apparently widely different polymer types, such as fibers, plastics, adhesives, rubbers, chemical coatings, free films, etc.

The multi-billion dollar contribution to our economy of these industries is a calculable item; the deep impact on our standard of living is far more difficult to evaluate. The dilemma of technological obsolescence—both for older materials and also by competition within this new scientific framework—has posed difficult financial and sales problems for business.

Consumer benefits, however, are numerous. To generalize, improved goods for less money have resulted. This is so in many ways: through the replacement of a scarce commodity by a plentiful one, by blending a new product with an older one for specific property upgrading, in the development of wholly new approaches to both new and old situations, and also by introducing new standards and values. Look around, yourself. Even a cursory examination will reveal an almost uncountable number of applications derived from recent polymer advances.

An outstanding example of almost revolutionary change is the field of packaging. Modern merchandising methods in team with today's new film formers have brought new concepts and esthetic values to the sale of food, toys, hardware, notions, and the thousand and one other items adaptable to "see through" wrapping techniques; they have expanded coated paper container usage remarkably, through higher standards of excellence; and they have been responsible for the infinite variety of labeling, designed for maximum visual impact and product identification.

Our industry, by supplying coatings for paper and plastic film, and printing inks, has a large interest in this expanding field. As an indication of size, consider that flexible packaging plastic film consumption should hit the billion pound per year figure in 1962, a 25 per cent increase over 1960's demand (*Chemical and Engineering News*, April 18, 1960, p. 54). Figures for the total quantity of paper and plastic film packaging products that are coated and/or printed are hard to pin down, but it is significant that annual shipments of converted flexible packaging products were almost half a billion dollars in 1959 (*Paper, Film and Foil Converter*, June 1960, p. 41). This amount includes such diverse classifications as printed rolls and sheets (cellophane, paper, foil); laminated or coated rolls and sheets; bags, pouches, envelopes, tubes, etc. (cellophane, polyethylene, glassine, foil combinations).

Certain it is though, that a significant quantity of these billions of square feet of wrapping materials and containers receive one of our numerous chemical coatings. High speed machinery is utilized to apply such diverse types of organic resin-based finishes as lacquers, catalyzed alkyd-ureas, solution vinyls, latices, and hot melt coatings. This particular technology has advanced to the point where not only is the normal increment of protection and decoration realized, but by proper choice of base paper product and of the coating, multi-trip containers are being produced.

The ability to remarkably upgrade specific properties by the use of these thin, rapidly cured coatings is being extensively uti-

lized in another facet of the paper converting industry, the manufacture of hot drink cups, paper plates, and other temporary food containers. And in still another area are the so-called "skid-proof" or "non-slip" coatings for cardboard containers, which impart vastly improved stacking qualities.

By their ability to impart these and other properties—such as controlled degrees of moisture and gaseous vapor permeability (or impermeability), resistance to penetration by greases, fats, and oils; heat sealability, and other specifically tailored advantages—these finishes are well on their way to adding a third classification, *utility*, to the traditional *protection* and *decoration* usually attributed to coatings.

Versatility

EDITORIAL deadlines being what they are, it is possible that by the time this is in print—and adding on the Christmas and end-of-the-year hiatus — W. R. Grace and Co. will have shed more light on their newest development. Did the "Fertilizer Doubles as Pigment" headline in *Chemical Week* (Oct. 1, 1960, p. 53) catch your eye? The fertilizer compounds are non-burning, premium priced materials—and well they should be, for they can also be used as pigments. But these are not ordinary coloring matter: the colors resemble those used on Chinese pottery!

And this is no mean achievement. Four thousand years of Chinese cultural development include unsurpassed ceramic art from prehistoric times to the era of their highest development, during the Ming dynasty, which ended in mid-seventeenth century. The soft green glazes, approaching jade in color tone, are particularly difficult to duplicate.

I must get an extra bag of that pigment and bring it home for fertilizer!—or vice versa?

New Deals in Wheels

THE sociological and economic influence of the production of over 180 million automobiles in this country during the past half century is a deeply (and repetitively) explored phenomenon. The contribution of the manufacture of six to seven million new cars each year to the health of the finishes business is, nevertheless, quite essential. Using the conservative estimate of five gallons of organic coatings applied per car, it is obvious that over 100 million dollars results from this annual race against obsolescence.

Going one step further, consider that we have almost 2,500,000 miles of paved roadways in the United States. If merely one four-inch-wide stripe of marking paint was layed down each year on these highways and byways, approximately nine million gallons of paint would be used (assuming a one mil wet film thickness at 30 per cent solids by volume—and If I haven't made a decimal point error!). Here certainly is another healthy chunk of business which might very well run several times this minimum calculation.

The direct impact of the automotive industry, considering it in all of its facets, would also include such factors as used car refinishing, painting and re-painting the tens of thousands of service stations that dot the land, finishing innumerable traffic signals, producing the even greater number of pertinent directional and instructive signs, and so on, *ad infinitum*.

But with all of this to the credit of our industry, a development program should be initiated to alleviate a pressing problem. It happens that a goodly length of the miles put down from those nine (or more) million gallons or road lines need to be changed on occasion. The removal of these stripes is a major undertaking. They can be abraded off—a costly process. They may be painted over—good for our production but a poor substitute for proper, rapid, thorough removal. An economical stripping compound (or method) is urgently required. Solving this problem would be a real public relations *coup*.

R & D

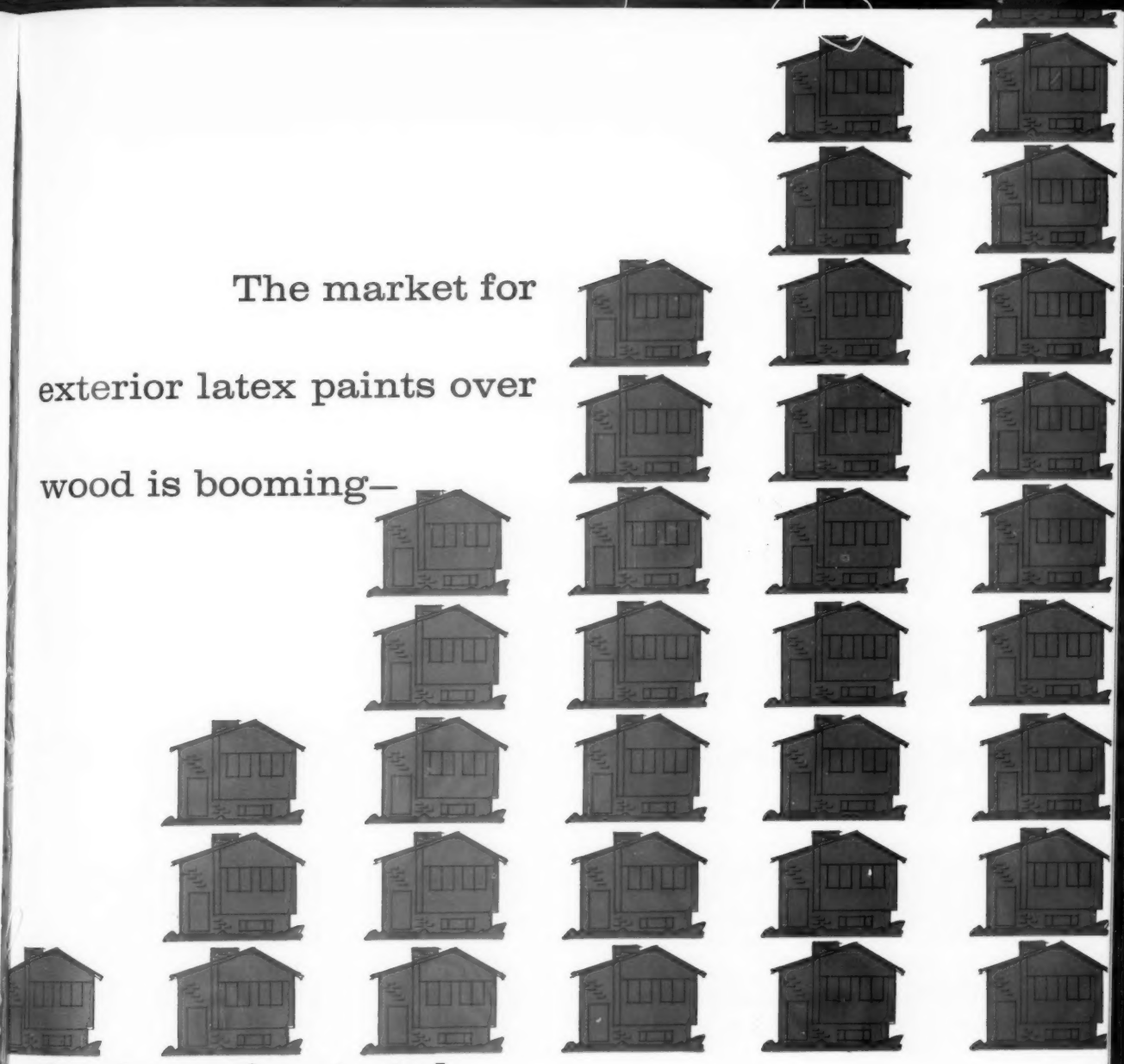
THE space age is only three years old but it has served to focus attention on the financial and economic influence of that esoteric phase of our productivity termed *research* and *development* (or, more familiarly and simply, R & D). Blatant figures tell a one-sided story, but nevertheless, in this instance, one of impressive growth. Back in 1930 total R & D spending was $166 million (70% by industry, 16% by Federal Government, 14% by universities). On the eve of World War II, in 1940, spending was up to $345 million, with the proportions showing no significant difference.

During the war period the Government poured out $500 million toward the $600 million average annual R & D bill. While the percentage during the '50's was not so high, the Federal Government has contributed 50 to 60 per cent of R & D funds that have grown so fantastically, it is estimated that about $13 *billions* will be spent in 1961. (These figures are from *Chemical and Engineering News*, Oct. 10, 1960, pp. 22-24.)

We are therefore investing about 2.6 per cent of our Gross National Product in direct scientific endeavor—a great portion of it toward National Defense projects. For comparison, education outlays are estimated at $23 billion, about 4.6 per cent of the G.N.P. These two figures tell a part of the story of the growth of this country, the importance of a highly skilled labor force utilizing continually advancing techniques. These expenditures that contribute greatly to increased productivity and therefore to higher standards of living.

Because of the necessity to evolve the tools of defense and counter-attack, about 80 per cent of Government funds are allocated toward the Development phase. It is hoped that Research—or Basic Research, more specifically—will be considered more important in the near future. It is quite obvious that expansion during the next generation can only be based on the fundamental discoveries of the current scientists, who have already borrowed so deeply (albeit very successfully) from their immediate predecessors.

Certainly organic polymer R & D—which has contributed so enormously to the progress of the coating industry—has set a fast pace recently. It is hoped that these efforts will continue unabaited during the coming expanding years.



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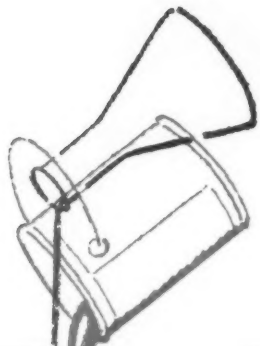

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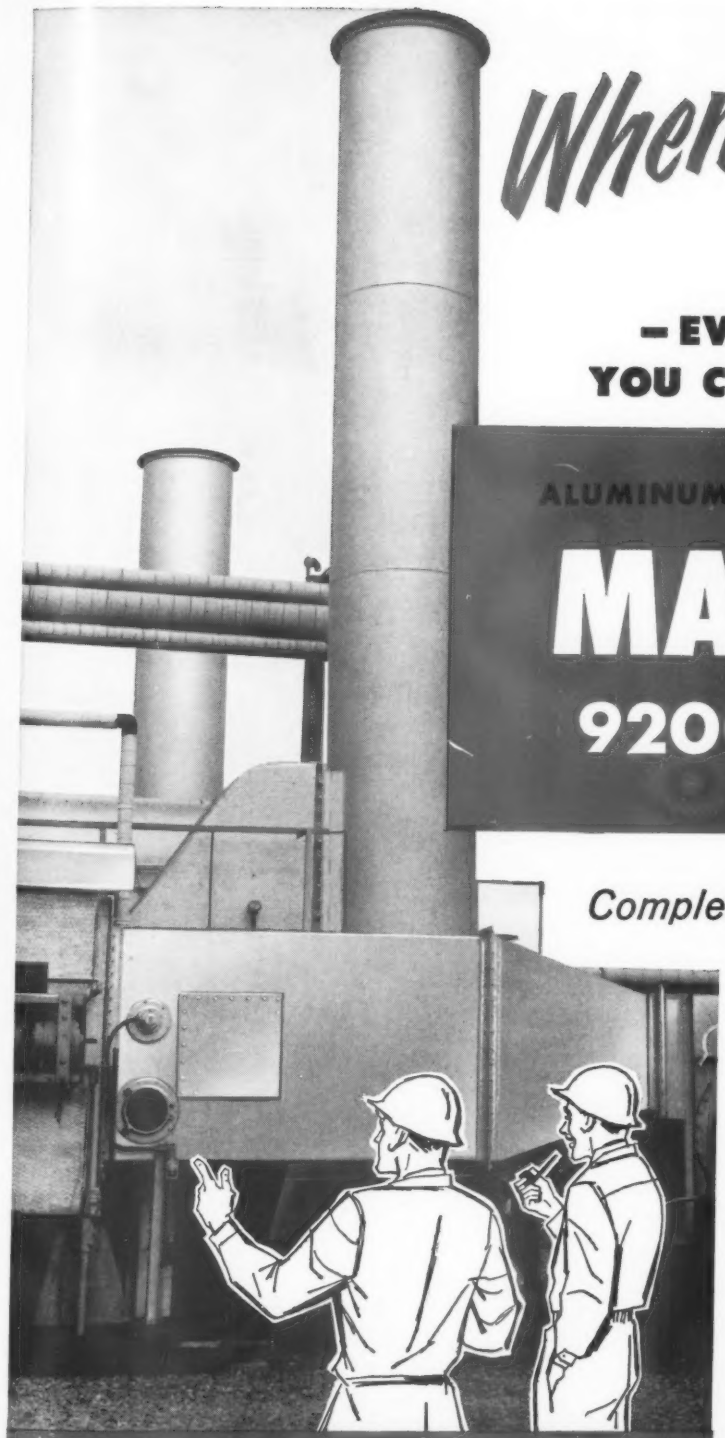

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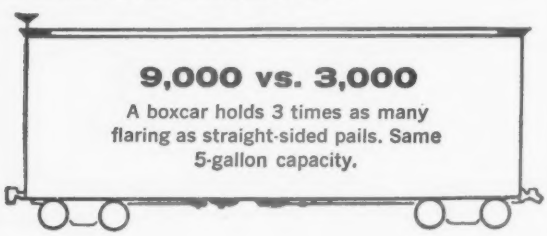

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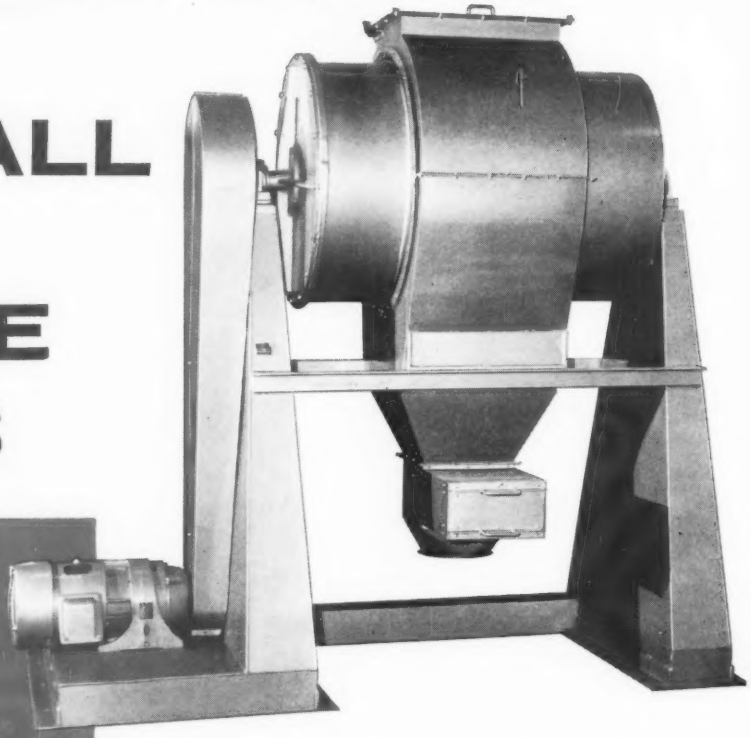
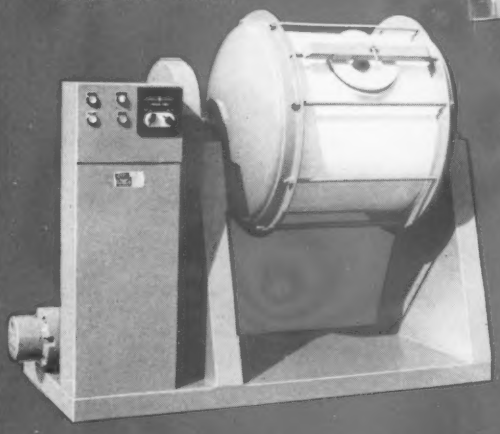
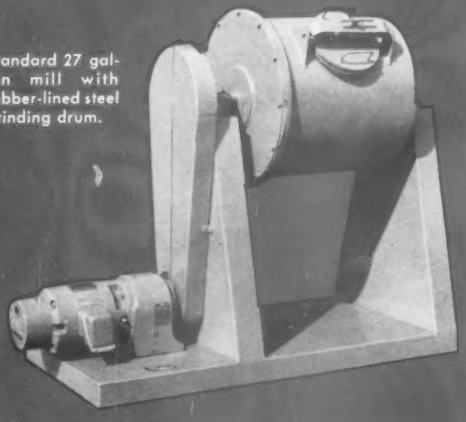


210 gallon rubber-lined unit with stainless steel dustless discharge housing, 2-speed motor.

This 52 gallon mill has high density porcelain grinding jar, timer, motor starter, electric brake.



Standard 27 gallon mill with rubber-lined steel grinding drum.



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EFFICIENT ADMINISTRATION

By

Lawrence Shatkin

WILLIAM M. Vermilye stated "the chief function of the chief executive is the inspiration of enthusiasm in his organization. And he must so constitute the channels for the dissemination of this enthusiasm that it reaches the lowest worker undimmed and undiminished." This focuses on the management of people, which means that an effective administrator must be well rounded, exhibiting leadership, courage, judgment, vision and flexibility. These must be balanced in their proper perspective in order to achieve a high degree of effectiveness.

Historical Background

Management, like other fields of study, has gone through several stages of development. Men such as Taylor, Schumpeter, Fayol, Follett, Mayo, Urwick and Drucker played a part in its development up to the present time.

Frederick Winslow Taylor spoke of scientific management during the early part of this century, which focused on the individual. Schumpeter's approach could be described as managerial economics, in which his theory of the business cycle centered on the concept of enterprise functions and innovation. Elton Mayo described the human relation aspect, which was the origin of personnel management.

Henri Fayol, a famous French industrialist, divided the operations of business into six main groups—technical, commercial, financial, security, accounting, and administrative operations. He broke down this function of administration into five main groups–to plan, to organize, to command, to coordinate and to control. In other words, Fayol had an organizational approach which looked for results.

Today, theorists and practitioners have been concerned with the impact of the large enterprise on society, and Professor Drucker has expounded a penetrating analysis on concepts such as innovation, the management of innovation, and frontiers of management.

A successful administrator has to acquire these various viewpoints. His job is to unify these schools of thought in his practice of management.

Attributes of Leadership

The effective leader has the ability to view the entire situation, ask the right questions, define the problems, and make the right decisions affecting the entire organization. This peripheral structure is built around an inner core of understanding, and the quality of the leadership displayed filters through the entire company and determines how effective the group functions.

His competence lies in the field of planning, coordinating and controlling the activities which comprise the business. He makes effective use of the resources at his disposal. His leadership serves as an inspiration for others in the group, in which a relationship is developed between themselves and the leader. Through this leadership must evolve the purpose of the organization, and the ethical, economic, social, and aesthetic values. This identification must be positive if the company is to move ahead, and this can only come about by a leader who shows a broad intellectual outlook, integrity, and a high sense of honor.

An effective leader must exhibit a high degree of social skill by showing an understanding and appreciation of human relationships. He seeks to develop an esprit de corps and encourages the release of creative potentials. He seeks to help others develop, and does not hesitate to delegate functions rather than tasks. His capacity for strength is inherent in his work, and he tends to make his subordinates self-directing and performance oriented. He appraises results not potentials. He is concerned about the future, and always ties in short and long-range programs. He is what psychologists would call "emotionally involved."

Clarence F. Randall summed this up very succintly. He stated, "leadership, like everything else in life that is vital, finds its source in understanding. To be worthy of management responsibility today, a man must have insight into the human heart, for unless he has an awareness of human problems, a sensitivity toward the hopes and aspirations of those whom he supervises, and a capacity for analysis of of the emotional forces that motivate their conduct, the projects entrusted to him will not get ahead —no matter how often wages are raised."

An Effective Administrator

Robert L. Katz in the Havard Business Review described the

The opinions expressed in this feature are not necessarily those of any particular firm or organization.

three basic skills needed for successful administration—technical, human and conceptual.

As one advances in the hierarchical structure, the conceptual skill becomes of vital importance, because this skill enables one to see the enterprise as a whole. The administrator is able to "size-up" a problem, see the relationships between functions and what each contribute to the whole, and distinguish between those problems that are major from those that are of lesser importance. This conceptual skill is exemplified by marketing managers, who view the affect of their marketing decisions on the entire organization—production, finance, research, sales, etc. The effective administrator has the problem of paying attention to the firm's objectives, and to those of his employees. The conceptual skill can be developed through practice and learning, since all significant learning is personal, and this conceptual skill must become a part of the executive's make-up.

Communications

Subordinates prefer more frequent discussions but do not want to talk about their personal traits. Effective administrators must impart effective communications, because we not only communicate information, but also our attitudes and feelings about things. Large discrepancies are reported between what supervisors report they do and the way their subordinates see them behaving. Subordinates expect their supervisors to be able to exercise an influence upward in dealing with problems on the job and in handling problems which affect them and their well-being. When a supervisor cannot meet these expectations of the workers, an unfavorable reaction is likely to occur. The administrator must take the initiative in keeping everyone in the organization informed.

Research Data

Table 1 indicates the information desired by production supervisors to help them do a better job.

Table 1
Information Desired By Production Supervisors

Kind of Information	Rank Order
The industry that my company is a part of	7
The over-all picture of my company	1
The department in which I work	3
Departmental policy	4
My boss' work	8
My unit	10
My duties and responsibilities	2
My authority	5
Technical information about my work	6
Technical information about other areas	9

This further discloses that conceptual skills must become part of all management. If the lower levels of management can understand the purpose of the business of which they are a part, they will become more effective administrators and be ready to assume executive leadership in the future. Most failures of managers are due to a lack of these skills rather than technical incompetence. We must learn what makes a person want to do better, and implement this into the company program. I think this is the heart of administration. We should be encouraged by the poet Robert Browning, who said "ah but a man's reach should exceed his grasp."

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Five Reasons Why ASBESTINE® 325 Improves Products, Saves Money

ASBESTINE 325, the first "tailored" magnesium silicate of the famous ASBESTINE family, displays several advantages which can save you money and improve your products. That's why ASBESTINE 325 is popular as the sole functional pigment in many house paints, finds increased use in other finishes and is included in numerous coatings' research and development programs.

Here are five important reasons why you can expect ASBESTINE 325 to upgrade performance and lower costs in your current formulations or those you are developing.

1. Lowers Oil Demand—Proper selection of ore combined with "tailored" particle size distribution, i.e., oversize particles removed, intermediate sizes balanced and fines proportioned, accomplish this result.

2. Reduces Grinding Time—Is a stir-in grade. Absence of large particles and agglomerates, combined with its easy wetting characteristics, effect a Hegman of 4-4½ in minimum time with conventional mixing equipment.

3. Improves Leveling—Paints properly formulated with ASBESTINE 325 tend to exhibit improved sag resistance, easier brushability, and better leveling.

4. Aids Wetting—In oil, oleoresinous or water emulsion formulations ASBESTINE 325 wets easily. Because it wets readily, complete dispersion can be expected quickly and suspension maintained. Does not have after-wetting tendencies.

5. Lengthens Shelf Life—Tests show paints made with ASBESTINE 325 resist hard settling—even after prolonged storage. Fluid consistency is restored with quick agitation because of soft settling properties.

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New Developments

Antara Develops New Surfactants

Antara Chemicals Div. of General Aniline & Film Corp., New York, announces the introduction and availability of a new series of surface active agents. These new anionic surfactants will be sold under the newly established trademark as "Gafac" surfactants.

Each of these new products was designed to meet specific market needs. The initial application areas for these first entrants in the new product line include the following fields: emulsion polymerization, textile (including synthetics), heavy duty liquid detergent cleaning compound, agricultural, metal cleaning and dry cleaning fields. In acrylate studies, the following advantages were noted when using the surfactants in place of a sulfonated anionic surfactant and a nonionic surfactant:

Film clarity,
Light stability,
Heat stability,
Buffering action,
Corrosion resistance,
Low residual monomer contact.

Additional applications work is being carried out to develop more detailed information about these products as emulsifiers for other latex systems.

Epoxy Coating System

New two-component epoxy coating system has been developed based on UNOX 201 and dimer acid by Union Carbide Chemicals Co. The coatings, according to the company, offer a unique combination of properties which ininclude: cost equivalent to alkyds; outstanding appearance and depth of gloss; excellent water and humidity resistance; good caustic resistance; etc.

Cargill Shows New Water Soluble Resin

New water soluble, thermosetting resin said to overcome three major industrial painting problems —fire, solvent toxicity and odor— was introduced by Cargill, Inc. The product is designed specifically for industrial baking finishes.

Properties of the new resin cited by the firm include:

Excellent hardness, fast curing, impact resistance, water and solvent resistance, good adhesion and flexibility;

Good wetting at all reductions, normally difficult to achieve in water based systems;

Formulable into practical paints at desirable solids content, as shown in viscosity reduction curves; and

Good oven baking characteristics after normal flash-off periods, unlike many water systems which require extended air-dry time to avoid oven blistering.

Cab Coating is applied to truck on Ford Motor Co.'s Twin Cities assembly line by workman using paint primer made with new water-soluble resin.

New Silicone Additives Improve Paint Application

Availability of five new silicone additives that provide greater control over surface characteristics of both air-dry and oven-bake finishes has been announced by Dow Corning Corp. Named "Syl-ad," these new paint additives represent substantial improvements over previously available silicone additives.

Effective in trace concentrations from 0.05 to 1%, Syl-ad additives overcome the recoating difficulties attributed to silicones. Only one of the five, Syl-ad 2, does not lend itself to recoating. Each of the new products is designed to aid paint formulators in achieving a specific film effect. For example:

syl-ad 1 provides maximum control over pigments — prevents floating, flooding and silking. Finishes containing up to 0.1% of this additive may be recoated without special surface preparation.

syl-ad 2 is similar to *syl-ad 1* but was developed for applications in which economy is of great importance and recoatability is of no concern.

syl-ad 6 simplifies application of lacquers and paints by improving flow-out and leveling in dip coating operations; reduces orange peel in spray processing.

syl-ad 11 reduces the surface friction of coatings. . .gives paints more surface slip. To the end user, this feature means greater mar and scuff resistance.

syl-ad 16 enables paint formulators to produce a variety of textures including hammer finishes. Added to baking and air-dry enamels, this silicone additive produces a fine grain texture; a hammer or large grain effect is obtained with enamels containing non-leafing aluminum pigments.

Formulations in which *syl-ad* additives have proved useful include: acrylic lacquers, acrylic baking enamels, alkyd melamine, long oil soya alkyds, butyrate lacquers, polyester resins and vinyls.

New Color Gun Developed by Autoblend

New Color Gun measures and dispenses all of the colorants and does not have to be purged when going from one colorant to another. This is accomplished through dual piston design (Patent Pending) which reportedly expels the colorant so there is no carry over.

The principal advantages cited by Autoblend Products Co., San Francisco, are as follows:

1. Direct positive displacement method of measurement assures infinite accuracy.
2. Simplicity of design results in reliability.
3. Low cost.
4. It is easy to set and fast to operate. More than one can operate it at a time, if more than one Color Gun is available.
5. It is light and portable for easy rearranging, or moving to the base paint when large quantities are being tinted.
6. The painting contractor may take it right on the job.
7. There are no routine maintenance functions to be performed.

The accuracy and lack of effective color cross-over have been tested and approved by leading colorant and paint manufacturers.

This color gun can be arranged to handle any color system. As little as 1/250 of a fluid ounce, or as much as 4 ounces may be dispensed from the same Color Gun.

Goodyear Develops Method Of Studying Paint Changes

A new method of studying various chemical changes in paints and other exterior coatings during outdoor exposure has been developed by The Goodyear Tire & Rubber Co.

This method, according to D. A. Hilliard, head of the company's paint section, permits the compounding of more durable paint materials because it allows a more accurate evaluation of molecular changes during outdoor exposure.

Previously, such studies were confined to laboratory infrared tests, which utilized coated salt blocks. Because of the blocks' moisture sensitivity, this technique could not be used outdoors.

Goodyear's new testing method uses the spectrum (molecular fingerprint) of coating materials deposited on highly reflective aluminum or tin-plated steel panels. The spectrum is recorded by an infrared spectrophotometer before, during and after completion of outdoor exposure.

Measurements are made directly from the coated panels by means of a reflector on the spectrophotometer and from the changes noted, the weathering rate is accurately measured.

Infrared spectrophotometer with a special reflector enables Goodyear paint specialists to chronicle the chemical changes that occur in paints as a result of actual outdoor exposure. The new testing technique, developed by Goodyear, opens the way for formulation of improved compounds.

Get the properties you want most in your formulations with . . .

AZO lead-free ZINC OXIDES

the paint industry's most versatile line

GRADE (Lead-free)	BULK DENSITY lbs./cu. ft.		PARTICLE SHAPE	PARTICLE SIZE	OIL ABSORPTION (Rub Out Method)	FOR PAINT CONSISTENCY (Rated High to Low)
	Conventional	AZODOX*				
AZO-22	20	35	Acicular	Long	21	5
AZO-11	23	40	Acicular	Medium	18	4
AZO-33	27	46	Acicular	Short	16	3
AZO-55	32	60	Nodular	Small	14	2
AZO-55-LO	36	65	Nodular	Medium	12	1
AZO-66 (French)	28	—	Nodular	Fine	12	–
AZO-77 (French)	24	—	Nodular	Fine	12	–

No need to compromise on the properties you want in your paint and enamel formulations. Set your specifications—then from the complete AZO line of lead-free zinc oxides choose the particular grade to meet your exact requirements. American Zinc is the only producer of acicular lead-free zinc oxides covering the full range of oil absorptions from high to low—including the intermediate ranges—in both conventional and Azodox forms.

In your formulations, AZO lead-free zinc oxides increase hiding power, film strength and tint retention . . . control chalking, inhibit mildew growth. Controlled refining of AZO zinc oxides removes objectionable fine particles, increases brightness and insures uniform consistency. WRITE FOR COMPLETE INFORMATION.

*AZODOX is American Zinc's de-aerated form of zinc oxide, with high apparent density. All other physical properties remain unchanged. Faster handling, less storage space, quicker mixing.

American Zinc also produces a wide line of leaded zinc oxides for general use in exterior house paints.

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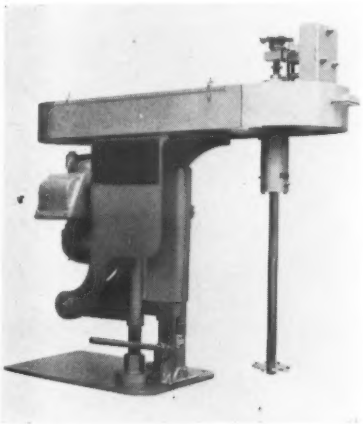
NEW EQUIPMENT AND MATERIALS

This section is intended to keep our readers informed of new materials and equipment. While every effort is made to include only reputable products, their presence here does not constitute an official endorsement.



MOREHOUSE-COWLES

DISSOLVER
Variable Speed System

New dissolver Model 5-VTV, has been added to the line of equipment for mixing, dispersing and deagglomerating. Basic new feature of the 5-VTV is the variable speed drive system with a range of from 1800 to 5400 rpm. and allowing for quick changes of speed while in operation.

Designed for small production, pilot plant operations and R & D facilities, the 5-VTV is especially adaptable in critical dispersing and mixing problems over a wide range of processes and materials.

New model comes equipped with the firm's unique impeller in 3 sizes, 4″, 6″ and 8″. Easily interchangeable, each impeller is especially designed for processing specific materials. Standard impellers and shafts are stainless steel.

Versatility and ease of operation are assured by hinge mount, permitting tilt-back through 45° for easy removal from tanks up to 20″ high. Height in lowered position is 38″. Hydraulic lift enables raising of entire assembly 11″ to maximum of 49″. Impeller will center in container up to 16″ diameter.

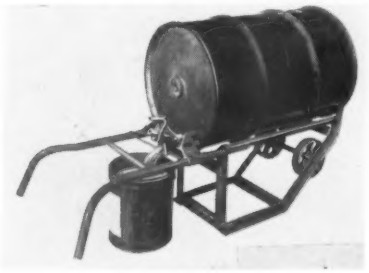
Capacity will depend on the nature of product and processing required. The dissolver is capable of handling a wide range of viscosities up to 50,000 centipoises in 5 to 40 gallon batches.

Morehouse-Cowles, Inc., Dept. PVP, 1150 San Fernando Rd., Los Angeles 65, Calif.

TRUCK and DRAIN RACK
Loads Automatically

A standard combination truck and drain rack that is designed for users of solvents, cutting oils and detergents, is announced.

It can be easily moved through crowded, narrow aisles and around



PALMER-SHILE

heavy machinery. To load just tilt truck against drum, sliding steel fingers down to engage top rim of drum; then rock truck back to wheeling position, and loading is automatic. Slight downward push on truck handles raises wheels and lays rack on floor, thus providing convenient drain of drum. Equipped with detachable handles that may be removed to conserve floor space—one pair will serve any number of trucks. All welded construction of heavy angle iron frame with sturdy steel tubing for handles. Two eight-inch roller bearing wheels. Weight approximately 90 lbs.

Palmer-Shile Co., Dept. PVP, 12622 Mansfield, Detroit 27, Mich.

METHYL ISOAMYL KETONE
Promotes Leveling

Methyl isoamyl ketone (MIAK), a high solvency retarder solvent for many resins, is now available commercially.

As a retarder solvent, MIAK promotes leveling and flow-out, and offers excellent blush control. Yet is has minimum retention in lacquer films since it is not as slow evaporating as many solvents of this type.

MIAK is also unique in that unlike most retarder solvents, its high solvent power allows formulation at a high solids content while maintaining a low solution viscosity.

Firm anticipates that this new addition to its line of solvents will find wide use as a replacement for many medium boiling solvents in formulations with nitrocellulose, ethyl cellulose, acrylic resins, half-second Butyrate, and vinyl copolymers.

Eastman Chemical Products, Dept. PVP, Kingsport, Tenn.

CLARK

FORK TRUCK
Pneumatic Tires

New 2000 lb. capacity, gas-powered fork truck equipped with

pneumatic tires has been introduced.

Designated the CY 20, the truck is designed for outside operation over gravel and semi-paved surfaces. It is equipped with pneumatic 6.50 by 10 drive and steer tires on a 54-in. wheelbase. Dual drive tires and wide profile tires (23 by 8.00) for extra flotation are available as optional equipment.

The CY 20 is powered by a 49 hp engine which has a displacement of 162 cu. in., and develops 123 lb-ft torque. The unit will start and stop on a 37.5 per cent grade with a 2000 lb load.

On both models, lift speed loaded is 74 fpm and empty 91 fpm. Upright channels are rolled from SAE 1045 fine grain steel. Nested inner upright travels on life-time lubricated rollers which provide continuous roller contact.

Lift and tilt of the upright is controlled from one lever mounted on right side of steering column, which enables operator to lift and tilt simultaneously.

Industrial Truck Div., Clark Equipment Co., Dept. PVP, Battle Creek, Mich.

SILICA PIGMENT
Reduced Reagglomeration

"Zeolex 80," a unique pigment to effectively disperse titanium dioxide in latex and emulsion paints, is now available.

The new synthetic silica pigment is said to promote better utilization of pure titanium dioxide and thus produces higher optical properties than are attained with other extender pigments. Because it combines just the right properties to coat or condition the titanium dioxide, it reduces reagglomeration and provides greater hiding power.

Cost savings over present formulations are attained since Zeolex 80 is about half the price of titanium dioxide and half its density. There is no sacrifice in film quality.

J. M. Huber Corp., Dept. PVP, 630 Third Ave., New York 17, N. Y.

POLYURETHANE VEHICLE
Abrasion-Resistant

New one-can stable polyurethane vehicle, "Spenkel F78," available at 50% in xylol and 50% in mineral spirits, is characterized by the outstanding properties of other polyurethane resins plus a very rapid dry.

Spenkel F78-50X and 50MS films dry tack free with conventional driers in 10 to 30 minutes depending on solvent choice and cure to a Sward harness of 20-25 overnight. Full hardness of 50-60 occurs between two and three weeks; however, the coatings have surprising flexibility.

The new vehicle which has the unique polyurethane toughness, mar and abrasion resistance combined with the fast dry recommends Spenkel F78 as an excellent product for use in floor finishes, traffic paints, aerosol coatings, furniture finishes, prefinished paneling and marine coatings plus specialty uses.

Pigmentation of the product requires no special treatment other than a slightly higher drier level. Spenkel F78 either clear or pigmented is recommended for aerosol finishes. Its fast dry, compatibility with propellants, good can stability and outstanding film properties will produce excellent finished products, the Company says.

Spencer Kellogg and Sons, Inc., Dept. PVP, Buffalo 5, N. Y.

NEW MATERIALS — EQUIPMENT

TETRACARBOXYBUTANE
Highly Reactive

New acid, 1,2,3,4 Tetracarboxybutane (T.C.B.) has a melting point of 187-191°C. It is soluble in water and most polar solvents and is insoluble in hydrocarbons.

T.C.B. is a highly reactive acid which is useful for the preparation of esters having potential applications as plasticizers and high temperature lubricants. The amide derivatives may also have possibilities as lubricants. The potential applications of T.C.B. in the coating industry include preparation of alkyd resins, polyesters which may be employed in resin manufacture and in polyurethane formulations.

The acid or it's anhydride will be important possibly as an epoxy curing agent.

T.C.B. is also a versatile intermediate an can probably be employed in the pharmaceutical, agricultural and textile industries. The presence of four (4) carboxyl groups permit the use of T.C.B. in the beverage industries where large quantities of carbon dioxide are required. These functional groups also indicate potential use as a sequestrant. The four carboxyl groups possess probably the same reactivity with various chemical reagents. It is therefore a material with possibilities that will depend on the imagination of the chemist.

Abco Chemical Co., Dept. PVP, 68 Fleet St., Jersey City 6, N. J.

Test Gauge
Wide Temperature

New temperature - compensated test gauge, that maintains a high degree of accuracy over temperatures ranging from polar to tropic, is announced.

These gauges, which meet Military Specifications, will be used on test benches, in test cells or on instrument panels. They will also be used as portable test instruments and in the shop for the calibration of production-type gauges.

Temperature compensation is built into both bourdon-tube and linkage. The bourdon tube is made of Ni-Span "C", a high nickel alloy.

PATENTS

Complete copies of any patents or trade-mark registration reported below may be obtained by sending 50c for each copy desired (to foreign countries $1.00 per copy) to the publisher.

Process for Preparing Polymeric Methyl Methacrylate, Iron Oxide Containing Coating Compositions

U. S. Patent. 2,956,970. Henry W. Godshalk, Flushing, Mich., assignor to E. I. du Pont de Nemours and Co., Wilmington, Dela., a corp., of Dela.

The process of preparing of a liquid coating composition which comprises mixing a clear solution of a polymer of methyl methacrylate having a relative viscosity of 1.117-1.196, as an essential film-forming constituent, with a clear dispersion of a pigment which is a reaction product of colloidal hydrous iron oxide and a fatty acid having at least 4 carbon atoms in proportions such that the weight of said polymer is at least equal to the weight of said pigment and, based on the total weight of the resulting fluid mix, the pigment constitutes up to 15% and the non-volatile constituents constitute up to 35%, to provide a clear fluid mixture which, as freshly prepared, yields a cloudy film when applied as a coating and dried, and then heating said mixture until it yields a clear film when applied as a coating and dried, said relative viscosity being the quotient obtained by dividing the efflux time of a solution of 0.25 gram of said polymer of methyl methacrylate in 50 cc. of ethylene dichloride by the efflux time of ethylene dichloride, said efflux times being measured in accordance with the procedure of ASTM-D-445-46T, Method B, at 25°C. using a modified Ostwald viscosimeter, Series 50.

Modified Melamine Coating Resins and Coating Compositions Containing Same

U. S. Patent 2,957,836. Harry M. Culbertson, Wilbraham, Mass., and Byron L. Williams, Jr., North Texas City, Tex., assignors to Monsanto Chemical Co., St. Louis, Mo., a corp. of Dela.

A resin comprising an etherfied reaction product of at least 4 mols of a monohydric acyclic alcohol containing 1-6 carbon atoms and a co-condensation product of 1 mol of melamine, 0.02-1.0 mol of an N-substituted melamine of the group consisting of N,N'-dicyclohexylmelamine, N,N',N''-tricyclohexylmelamine and mixtures thereof, and at least 4 mols of formaldehyde.

Fluorescent Coating Composition

U. S. Patent 2,956,027. James F. Thompson deceased, late of Cincinnati, Ohio, by Edna Weaver Thompson, executrix, Cincinnati, Ohio, assignor to Sterling Drug Inc., New York, N. Y., a corp. of Dela.

A fluorescent coating composition comprising a substantially colorless varnish having incorporated therein minor proportions by weight of a compound which fluoresces red under ultraviolet light, a compound which fluoresces blue under ultraviolet light, and a compound which fluoresces yellow under ultraviolet light, each of said compounds being substantially colorless in dilute solution by daylight and being in such proportion to each other that the mixture fluoresces white over a white surface under ultraviolet light.

A fluorescent coating composition comprising a substantially colorless varnish consisting essentially of a resin and a solvent for said resin, and approximately equal minor proportions by weight of 2-(3-hydroxy-2-naphthyl)benzimidazole, 4-methyl-7-dimethylaminocoumarin, and 3,7-bis(phenylcarbamylamino)dibenzothiophene 5,5-dioxide.

Method for Improving Odorless Naphthas

U. S. Patent 2,956,014. George W. Ayers, Chicago, and William A. Krewer, Arlington Heights, Ill., assignors to The Pure Oil Co., Chicago, Ill., a corp. of Ohio.

A method of preparing odor-free naphthas which comprises treating said naphthas with carboxymethylpyridinium hydrazide chloride at a temperature up to 200° F. and recovering an odor-free product from the mixture.

Curing of Oxidized Drying Oils With Aluminum Hydrocarbon compounds

U. S. Patent 2,955,950. John R. Lovett, Metuchen, Robert I. McDougall, Newark, and Merilyn T. Winters, Westfield, N. J., assignors to Esso Research and Engineering Co., a corp. of Dela.

A coating composition consisting essentially of an oxidized liquid polymer of from 60 to 100 parts of butadiene and from 40 to 0 parts of styrene, said oil having been oxidized to an oxygen content of from 10-20 wt. percent and an aluminum organic compound corresponding to the formula RR'Al*U* wherein R and R' are alkyl groups having 1 to 8 carbon atoms and *U* is selected from the group consisting of alkyl groups having 1 to 8 carbon atoms, hydrogen and halogen.

Polyester Resin Compositions of Long Chain Diethylenically Unsaturated Acids

U. S. Patent 2,957,837. Curtis W. Smith, Greenwich, Conn., and Clayton A. May, Piedmont, Calif., assignors to Shell Development Co., New York, N. Y. a corp. of Dela.

A resin composition having an acid number ranging from about 5 to about 50 comprising the reaction product of phthalic anhydride, glycerol, soya fatty acids and 5% to 95% of an acid having the formula

HOOC—R—COOH

wherein R is a divalent radical having from 14 to 26 carbon atoms, said radical having two unsaturated linkages which are at least four carbon atoms removed from each other and at least four carbon atoms removed from the carboxy groups, the amount of the anhydride and glycerol as to each other ranging from equimolar amounts to an excess up to about 40 mole percent, the amount of soya fatty acids ranging from 2 to 60% of the acid of the formula HOOC—R—COOH, said polyester being prepared at temperatures ranging from about 100:C. to about 300:C.

Film Forming Compositions of Polyethylene and Polypropylene Film Thereof, and Method of Making Same

U. S. Patent 2,956,042. William F. Underwood, Oak Park, and Edward D. Fuller, Chicago, Ill., assignor to Union Carbide Corp., a corp. of N. Y.

A film-forming composition comprising a homogeneous mixture of 100 parts by weight of a normally solid film-forming ethylene polymer and 0.1 to 2.0 parts by weight of polypropylene.

Fire-Retardant Coating Composition

U. S. Patent 2,956,037. Joseph M. Venable, Nitro, W. Va., assignor to Vimasco Corporation, Nitro, W. Va., a corp. of W. Va.

A non-aqueous fire-retardant coating composition comprising a synthetic base resin consisting essentially of butylated melamine formaldehyde, a plasticizer selected from the group consisting of tris-B-chloroethyl phosphate, tricresyl phosphate, tributyl phosphate, cresyl phenyl phosphate, tributoxyethyl phosphate and tri-2-ethylhexyl phosphate, a spumific selected from the group consisting of polyphosphorylamide and mono-ammonium phosphate, a carbonific selected from the group consisting of pentaerythritol and tripentaerythritol, an intumescing aid consisting of dicyandiamide, and a solvent system.

Aminoplast Resins and Coating Compositions Containing Same

U. S. Patent 2,957,835. Harry M. Culbertson, Wilbraham, Mass., and Byron L. Williams, Jr., North Texas City, Tex., assignors to Monsanto Chemical Co., St. Louis, Mo., a corp. of Dela.

A resin comprising an etherified reaction product of at least 4 mols of a monohydric acryclic alcohol containing 1-6 carbon atoms and a co-condensation product of 1 mol of melamine, 0.02-1.0 mol of an N-substituted melamine and at least 4 mols of formaldehyde; said N-substituted melamine being selected from the group consisting of N,N'-dialkylmelamines, N,N',N''-trialkylmelamines, and mixtures thereof, the individual alkyl groups of said N-substituted melamines being acyclic and containing a maximum of about 20 carbon atoms, the total number of carbon atoms contained in all of said alkyl groups not exceeding about 36.

TECHNICAL Bulletins

ACRYLIC EMULSIONS

New 64-page book giving detailed information on the results of a seven-year study of applications and exposure tests of exterior paints made with Rhoplex AC-33, 100% acrylic resin emulsion, is now available. The book, designated Progress Report #7, contains 21 tables of formulations, applications, and test results, and will be of interest to paint manufacturers, and specification writers.

Rhoplex AC-33 was introduced to the paint industry in 1953. The polymer in this emulsion is tough, adherent, flexible, color retentive and resistant to ultraviolet light, alkalies and moisture. Seven years of outdoor exposure experience on acrylic paints has confirmed these properties.

The newly published book contains details on the seven-year exterior test program conducted by Rohm & Haas Company. It covers both commercial paint jobs and data on test panels. Materials on which the panel study was made include wood surfaces, asbestos-cement shingles, stucco, concrete blocks and cement.

Details are given on commercial applications in various climates. Several types of painted structures including homes and industrial plants are shown in the numerous photos in the publication.

Rohm & Haas Co., Dept. PVP, Washington Square, Philadelphia 5, Pa.

LIQUID FILLING MACHINE

Bulletin LF-60 describes a new automatic liquid filling machine that forms, fills and seals pouch-type containers.

Designed for packaging liquids, creams and pastes, the forms leakproof packages from roll stock of heat sealable, flexible packaging material — cellophane, foil, polyethylene, etc. Package sizes range in length from 1″ to 12″, and in width from ¾″ to 8½″.

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ABSTRACTS

The following are abstracts of papers presented at the September 11-16 meetiing of the American Chemical Society, Division of Organic Coatings and Plastics Chemistry in New York City, N. Y.

Drier Catalyst Activity of 1,10-Phenanthroline in in Organic Coatings. II. Lowering of the Activation Energy

By Gordon K. Wheeler, William H. Canty, R. T. Vanderbilt Co., and Raymond R. Myers, Lehigh University, Bethlehem, Pa.

The drying of a linseed soya alkyd at temperatures ranging from room temperature to 350°C. was analyzed kinetically in order to ascertain the roles of the manganese catalyst and of 1,10-phenanthroline which accelerates the catalyzed reaction. Drying times were converted to rates whose inverse temperature dependence obeyed the conventional logarithmic relation. Manganese lowered the over-all activation energy from 17 to 12 kcal. per mole; 1,10-phenanthroline, to 7.8 kcal. per mole. Four year's aging of the stock alkyd had no effect on the activation energies, except that the logarithmic relations developed a uniform curvature at high temperatures. The reduction in energy by both metal and 1,10-phenanthroline was interpreted as a localization of an unpaired oxygen electron by bonding to the metal during the induction period of the reaction when free radicals and oxygenated intermediates are not abundant. The collision term was reduced in value by the catalyst and accelerator and this effect was explained on the basis of steric factors.

Optimum Curing Conditions for Solid Epoxy Resins Determined by Statistical Evaluation

By Harry B. Bolson, Fort Wayne Laboratory, General Electric Co., Fort Wayne, Ind.

A low-melting solid epoxy resin and a medium melting point solid epoxy resin were each cured with acid anhydrides and dicyandiamide using three concentrations at three temperatures for three different times. Hardness values at 150:C. were determined on each cured sample with a penetrometer. An analysis of variance was performed to determine significant data and optimum values were calculated by use of orthogonal polynomials.

Generally, more than stoichiometric amounts of phthalic, tetrahydrophthalic, and HET anhydrides are needed to cure Shell EPONS 1001 and 1004. It was found that 0.5 to 1.5 stoichiometric amounts of dicyandiamide will provide suitable cure of Shell EPONS 1001 and 1004 between 160° and 200°C.

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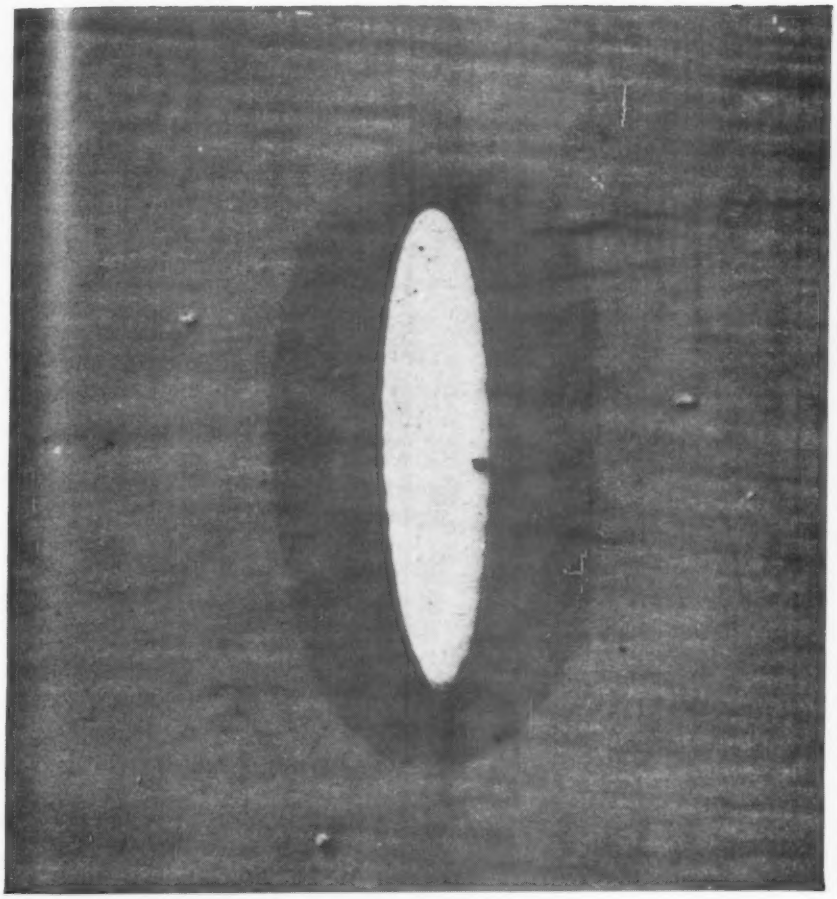

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Fluidized Bed Coating: An Analysis of the System

By F. J. Nagel and D. S. Richart, The Polymer Corp., Reading, Pa.

Simple in concept, the fluidized bed coating technique is rather complex when considered in its entirety. Proficiency in several technologies is required in order that properties and phenomena observed in one phase of operation can be properly evaluated in the context of the system. Some of the component operations that form the basis of the fluidized bed coating system are: Formulation of primers and coating materials; evaluation of coating materials and applied coatings; manufacture of coating materials; application of powders.

These phases are described, and data showing correlation between operational variables is presented. The relationship of the various phases to each other is also considered. Preheat and postheat time/temperature cycles, mass, time of immersion in the fluidized bed, and other pertinent variables are discussed with respect to their influence on coating thickness, edge coverage, and adhesion.

Because of the unique characteristics of this coating system, special problems in formulation, manufacture, and application are frequently encountered. These problems are reviewed and several tests proposed to aid in the characterization of coatings applied by the fluidized bed process.

Apparent Functionality of Isophthalic Acid in Alkyd Resins

By Robert Brown, Henry Ashjian and William Levine, Socony Paint Products, Metuchen, N. J. and Mobil Oil Co., Brooklyn, N. Y.

Phthalic anydride is shown to have a true functionality of two as used in Carothers' equation calculation. As generally recognized, a considerably greater functionality is observed in isophthalic acid alkyds. This is attributed to a side reaction, etherification of the polyols, occurring only in the isophthalic alkyd systems. The etherification mechanism is supported experimentally by quantitative obser vation of the water of reaction evolved in processing, and by infrared analyses of the resins and polyols separated therefrom.

A practical method of calculating the functionality of isophthalic acid alkyd resins is demonstrated. The general utility of the calculation is confirmed by the close agreement between calculated and observed functionalities. This Carothers' equation calculation, assuming reproducible formation of simple ethers, enables easy conversion from phthalic anhydride to isophthalic acid systems.

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Thermosetting Compositions from the Reaction of Acrylamide Interpolymers with Formaldehyde

By R. M. Christenson and D. P. Hart, Pittsburgh Plate Glass Co., Springdale, Pa.

Solution interpolymers of acrylamide and several other monomers have been prepared at relatively low molecular weights and subsequently reacted with formaldehyde in the presence of alcohols to form methylol or etherified methylol substituents on the pendant amide groups. A variety of monomers has been copolymerized with acrylamide to permit final polymeric products which have widely different properties. Monomers which have been especially useful are acrylates, methacrylates, styrene, and vinyltoluene. Acrylamide is usually used at a 3 to 25% level in the interpolymer to give good cross-linking behavior. After the preparation of the base interpolymer by free radical induced polymerization in organic solvents, an alcoholic solution of formaldehyde is added, the solution ma des lightly acidic, and condensation of the formaldehyde and pendant amide groups effected to give methylol substituents.

The polymers formed are moderate in viscosity, at 50% solids the viscosity is usually about *P-Z* in the Cardner Holdt scale, and spray, dip, and roll cost readily by conventional techniques. Uncured films tend to be weak, easily shattered, solvent-sensitive, and poor in adhesion and in general, exhibit the properties of addition polymers where molecular weight has been decreased to achieve maximum solubility. When baked at 300° to 350°F. very tough solvent-resistant films result.

Formable Thermosetting Acrylic Polymers

By Earl E. Parker and Thomas L. St. Pierre, Pittsburgh Plate Glass Co., Springdale, Pa.

Over 150 copolymer systems were screened in a program designed to produce a transparent, thermosetting polymer suitable for use in high speed military aircraft. It was desired that this product have a stable, stretchable, formable, intermediate stage of cure.

Optimum results were obtained with a two-component system containing diallyl itaconate and styrene and a five-component system containing diallyl itaconate, styrene, triallyl cyanurate, allyl methacrylate, and methyl methacrylate. Both of these products could be formed or multiaxially stretched at an intermediate stage of cure. The cure could then be completed by first the use of ionizing radiation and then heat. Multiaxial stretching did not produce the desired *K*-toughness factor. All of the other target physical properties were either reached or closely approximated.

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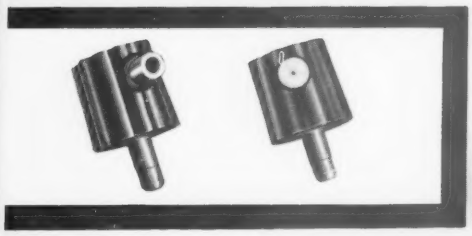

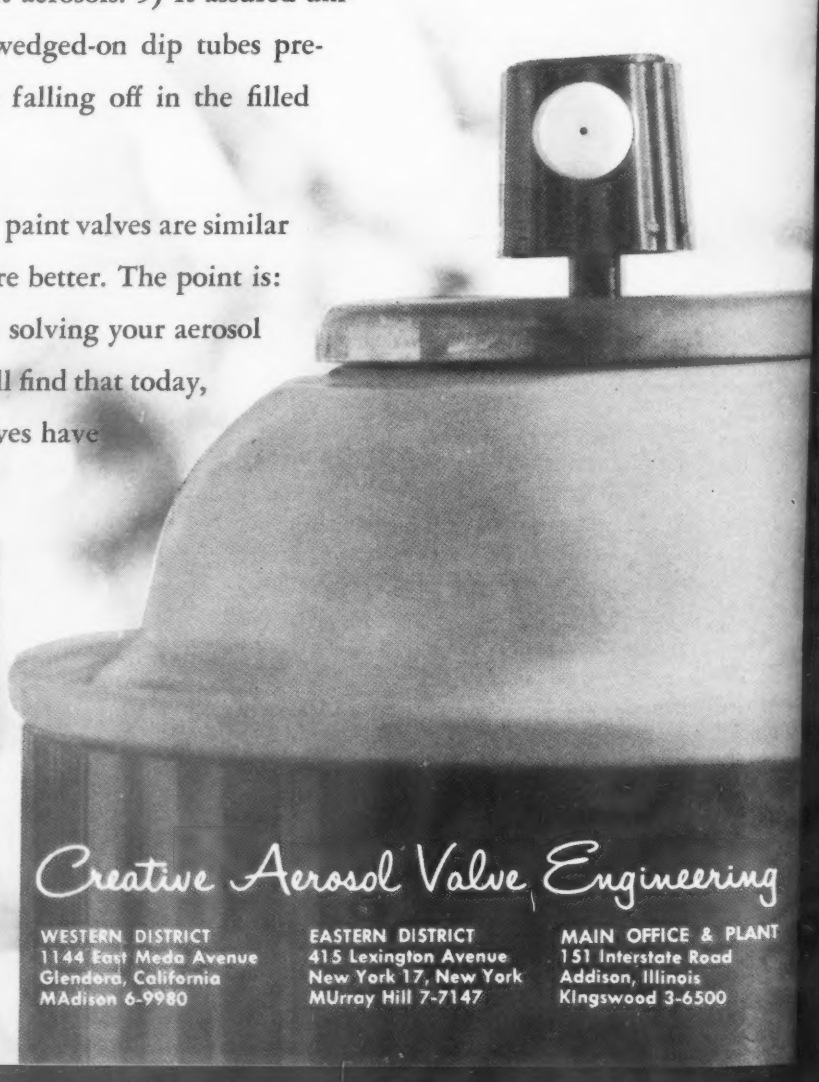

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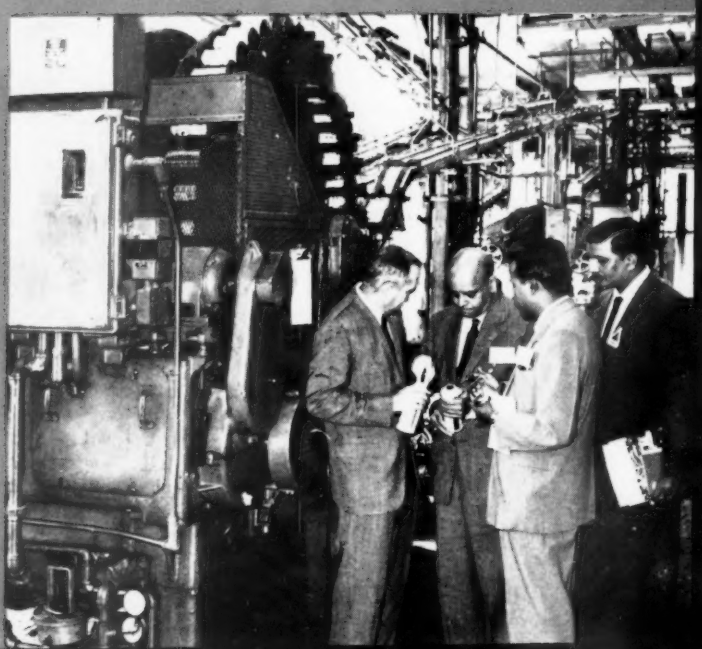

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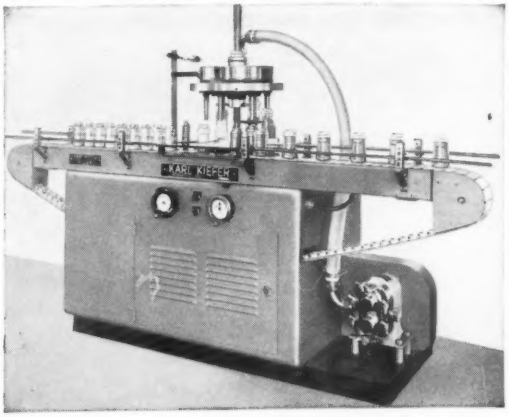

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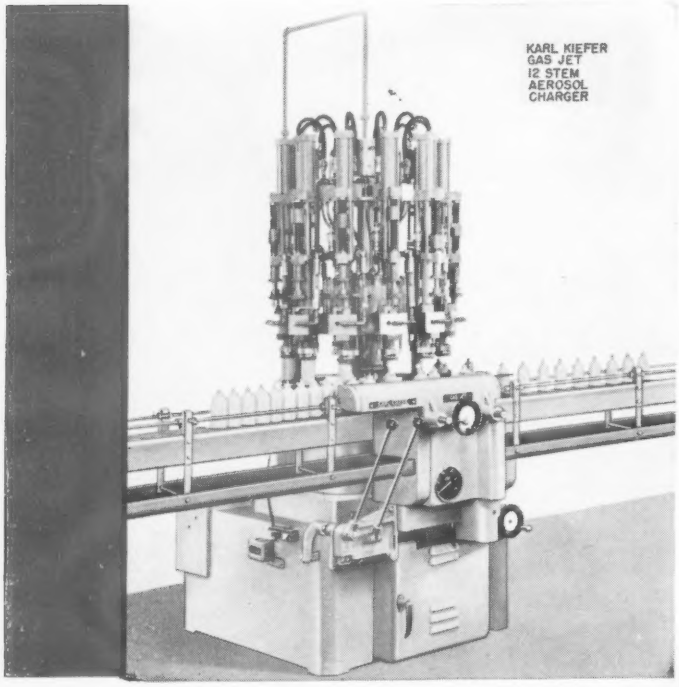

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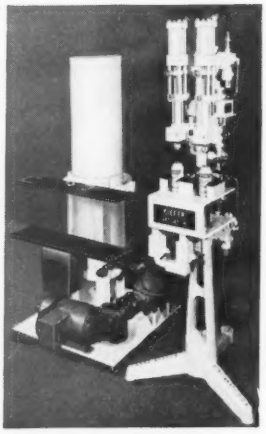

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TECHNICAL ASPECTS of AEROSOL VALVES

By

Dr. John J. Sciarra*

SINCE aerosol products depend upon the power of a compressed or liquefied gas to expel their contents, a specially designed valve, capable of being opened and closed with no loss or contamination of the remaining contents, is required. Such valves have been designed and are responsible, along with the containers and propellants, for the widespread use of aerosol products. It is through the valve that the product is obtained and the valve mechanism may be considered as one of the critical parts of the aerosol package. The product concentrate will come in contact with almost all parts of the valve structure giving rise to incompatibilities similar to those present between container and product and between product and propellant. In addition, some of the valve components may be made from materials other than metals, such as plastics, natural and synthetic rubber, polyethylene, etc. giving rise to additional incompatibilities unless they are considered prior to formulation of the product. The reactions, if any, between valve and propellant should be investigated since once the valve becomes inoperative, then the contents of the container cannot be dispensed.

The aerosol valve will also serve other useful functions in addition to allowing the product to be dispensed. Through use of different type actuators the product can be dispensed as a stream, fine spray or mist, or foam, Of course other factors, such as propellants, formulation, etc. will also influence the type of spray produced.

Component Parts

Most aerosol valves are composed of certain basic parts, consisting essentially of a series of orifices with connecting passages. There are generally two or three of these orifices in each valve. The discharge rate of the product is controlled, for the most part, by the size of the smallest internal orifice while the dimensions of the external orifice generally determines or influences the degree of atomization. As the liquid passes from one orifice to another, it expands causing a drop in pressure which results in a partial boiling of the liquid. This process is repeated by the liquid at the other orifices; the vaporization of propellant becoming more violent at each orifice, resulting in a complete atomization of the product at the final orifice. It is this type of valve which finds widespread application for paints and related paint products. Other valves such as metered valves, foam valves, stream valves, etc., operate on slightly different type construction. The above described, spray type valve will dispense the contents of the container continuously as long as the valve is left in the open position.

In addition to the orifices, the valve is made up of an actuator button, valve stem, natural or synthetic rubber gasket seal, valve housing, stainless steel or nylon spring, and dip tube. Figure 1 shows such components and the role played by each. The gasket prevents the liquid phase of the product from flowing through the valve stem, by sealing it when the valve is in the closed position. Tension on the valve stem is maintained by the spring. When the valve stem (or the actuator) is depressed, the orifice is exposed to the product concentrate allowing access to the expansion chambers within the valve housing.

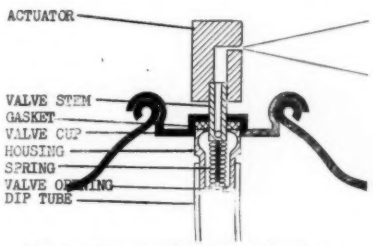

Fig. 1. Spray valve cross-section.

The product and propellant will come into intimate contact with most parts of the valve and steps must be taken to either choose materials which are not affected by the propellant or product concentrate, or protect these components by suitable coatings. Nylon, being relatively inert is generally used for the valve stem and housing. This works well for most products except some of the insecticides based on kerosene or xylene. In these cases, brass stems are utilized. Nylon seems to work well with paint products and is used in those valves recommended for use with paints.

The rubber gasket must be made of material which is physically and chemically unaffected by the product or propellants. Leakage of the product may be due to a swelling of the gasket material.

*Associate Professor of Pharmaceutical Chemistry, St. John's University, College of Pharmacy, Jamaica 32, New York.

Shrinkage is usually accompanied by a hardening of the gasket and loss of resiliency which often results in leakage because of consequent improper sealing. The ideal gasket material is one which neither swells excessively nor shrinks when in contact with the product or propellant. Unfortunately many solvents react differently with these materials so that more than one material must be available. Buna N and Neoprene have been found to be the most compatible with product concentrates. Unless the formulation contains over 25-30% methylene chloride, Buna N can be safely used. Greater concentrations of methylene chloride will cause Buna N gaskets to shrink. In these cases Neoprene can be safely used. Another problem which may be present with certain type gasket materials in leeching out of one or more components of the gasket by the product or propellant. This may not affect the performance of the valve but where the leeched out component is colored, the product may be discolored. This is especially important with paint products and can result in loss of repeat sales for the paint due to unsatisfactory performance of the product.

Stainless steel is used to a great extent for the manufacture of the spring since it is, for the most part, non-reactive. In cases of extremely corrosive products, a coated spring or a nylon spring can be used. The only other metallic component of the valve is the valve cup which is generally made of steel plate, coated with tin. The tin will vary from 0.25 to 1 pound tin plate which is resistant to most solvents. However, in the case of some of the more corrosive water based products or high acid or alkaline products, an additional coating of enamel, epoxy resin, or other suitable coating material can be added to increase resistance to the deliterious effects of the product.

Dip Tubes

An additional component which should be considered along with the valve is the dip tube. The dip tube serves several purposes:

1)Conveys the liquid from the bottom of the container to the dispensing valve at the top.

2) Prevents the propellant from escaping without dispensing the contents of the package (when used according to directions).

The dip tube comes into intimate contact with both product and propellant and needless to say should be resistant to both physical and chemical attack. Polyethylenes and nylons have been found to possess many desirable properties making them useful for this purpose. However, since the dip tube is stretched to fit tightly on the valve housing, it is possible that on standing the polyethylene or nylon will crack or breakdown at this point rendering the product useless since it cannot be dispensed. This has been overcome through the use of specially developed polyethylene compounds. Figure #2 shows the relationship

Photo courtesy of Anchor Plastics

Fig. 2. Cutaway view shows dip tube assembled to the valve and positioned in container.

of the dip tube to the rest of the valve. As can be seen from the photograph, the tube extends almost to the bottom of the container. If the tube is too short, then all of the product will not be dispensed while a tube touching the bottom of the container will tend to block the passage of liquid. In this connection it might be well to mention that most of the materials used for dip tubes tend to elongate when immersed in certain solvents and propellants for long periods of time. This elongation should be corrected for when determining the length of the dip tube, Polypropylene is also being investigated, as a possible material for dip tubes.

Discharge Rate

Important to both the aerosol manufacturer and the aerosol user is the rate of discharge of the product. With a paint product one wishes to coat the surface in as short as time as possible. Too fast or too slow a rate will result in unsatisfactory results. As mentioned previously, the discharge rate is controlled by the smallest orifice which is generally the valve body or valve stem orifice. By varying the size of these orifices various discharge rates can be obtained. The rates generally range from about 0.08 grams/second to about 1.5 grams/second. This is a function of temperature.

Valve Clogging

There is little danger of the orifices of the valve to become clogged when the formulation contains soluble materials that do not leave a large residue behind (room deodorants, insecticides, etc.) However, with products that are highly pigmented or those containing lacquers and resinous films there are other factors that must be considered. The drying of residual materials in the various orifices of the valve as well as the impactation of dry particles in these orifices may lead to a clogged valve and a useless aerosol package. These problems have been overcome to a great extent by slightly changing the design of some of the valves. The most outstanding advantage of this type of valve over many of the other valves is the absence of an internal orifice in the basic valve assembly. This feature will eliminate clogging problems since both the internal and external orifices are located within the removable actuator. It is a simple matter to remove and clean the actuator with turpentine or other suitable solvents. In the event this is not satisfactory, another actuator can be used. This cannot be done with valves having a internal orifice as part of the assembly. Another method which has proved satisfactory to prevent clogging is to instruct the user of the aerosol paint to invert the container after each use and allow some of the propellant to flow through the valve. This will remove any material trapped in the valve assembly.

Vapor Phase Holes

During the past year or so interest has been shown for valves which will allow the dispensing of the product regardless of the position of the container. These valves have several advantages over the conventional type valves:

1. Impossible to dispense only propellant.
2. Container can be tilted and even inverted in order to spray hard to reach places.

This can be accomplished by drilling small holes in the valve housing. This allows the product to be dispensed through the dip tube when the upright position and through the vapor phase hole when in the inverted position. Of course some of the propellant in the vapor

phase will escape along with product-propellant when in the upright position. A more elaborate valve, developed by R. A. Fulton of the United States Department of Agriculture, Agricultural Research Service, utilizes a dip tube with a hole drilled into each end. Each hole is fitted with a sliding porthole and depending upon the position of the container will either open or close the hole. In this case the product-propellant is dispensed. Still another modification has been developed by the Gulf Oil Company. This valve utilizes a slider as shown in Figure 3. When the container is upright, the slider seals off the auxiliary passageway allowing the product to be dispensed through the dip tube. When the container is inverted the slider will allow the product-propellant to travel through the auxiliary passageway and out the valve. Since the dip tube is filled with product-propellant there is no lose of pure propellant.

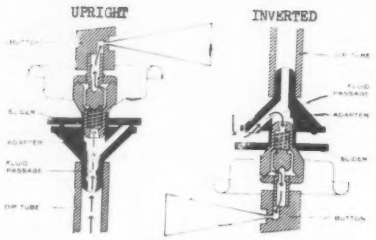

Fig. 3. Valve modification using slider.

Other Valves

No attempt has been made in this article to discuss metering valves, solid stream valves, one-shot valves, glass bottle valves, etc., since attention was turned to those valves finding use in paints and related products. It is possible that as technology increases in the area of aerosol paints, some of these valves may come into use.

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Kartridg Pak Moves

Frank Craig, West Coast Representative for The Kartridg Pak Co., Mt. Prospect, Ill., has moved to 19111 E. Swanee Lane, Covina, Calif. He had previously been located in the San Francisco area.

The Kartridg Pak Co. makes complete aerosol filling lines for both small and large volume users, as well as the chub machine and linkers and strippers for packaging meat, sausage, certain foods and other semi-viscous products. The Kartridg Pak Co. is a wholly owned subsidiary of Oscar Mayer & Co., Madison, Wisc.

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The population center of the United States, Flora, Ill., also became the best painted town in preparation for the week-long Ford Festival which introduced the 1961 Ford automobiles. Under the sponsorship of Leo Allen, proprietor of the Flora Lumber Supply Co., Martin-Senour fluorescent spray enamels were provided to spark up the town's parking meters. Two huge Martin-Senour signs and thousands of paint caps worn by the town's youngsters during the week also helped promote the Martin-Senour participation in the festivities.

Aerosol Developments

Peterson Realigns Staff

Peterson Filling & Packaging Co., Danville, Ill., major aerosol contract packager, recently announced several organizational changes. J. K. Shea was promoted from Eastern sales manager to sales manager; William L. Rowley, from plant superintendent to plant manager; and Larry Ligocki to the newly-created position of chief machinist.

A graduate of St. Louis University, Mr. Shea joined Peterson Filling in 1955 after several years with the sales department of another filling company. Mr. Rowley who started with Peterson in 1955 as quality control supervisor, replaces Julius Hegeler, who has assumed full-time duties as treasurer. Mr. Ligocki joined the company in 1956 after many years with the Modern Machine Co. of Danville.

Also announced was the addition of Mrs. Marie Lambert to Peterson Filling's research staff. Until recently, Mrs. Lambert was a research supervisor at Prairie States Oil and Grease Co., Danville, a position she held for six years. Prior to that time, she had been associated with Michael Reese Research Foundation as a specialist in the fields of hematology and urology and their application to various pharmaceutical products. She holds a B.S. degree from the University of Wisconsin (1949).

Other plant appointments include Robert S. Black as foreman of the shipping department and Robert Rowley as foreman of the receiving department. David L. Parker has been appointed chief chemist and Roy Bush is quality control supervisor.

Peterson Filling & Packaging Co. was established by H. E. Peterson, president, and lists as its company officers R. J. Peterson, vice-president; E. C. Hegeler, secretary; Montfort A. Johnsen, director of research and J. P. Peterson, purchasing agent and office manager.

Dowling to Canco Post

Appointment of Fenton J. Dowling as western area manager of sales, has been announced by the Canco Division, American Can Co., New York. In his new post, Mr. Dowling will be located at the Canco Division's western area headquarters, 111 Sutter St., San Francisco. He will have charge of Canco Division sales activities in Alaska, Oregon, Washington, Idaho, Montana, Wyoming, Colorado, Utah, New Mexico, Arizona, California, and Northern Mexico.

Mr. Dowling is a 30-year veteran with Canco. His service dates from 1929, when he joined the company as a laboratory assistant in Maywood, Ill. Later administrative experience included service in the adjustment department in Chicago, followed by pre-World War II work in the Chicago sales district.

He served in the U. S. Navy from 1943 to 1946, in the Supply Branch, and was discharged with the rank of Lieutenant. After the war, he returned to Canco as as-

sistant district sales manager in Cleveland, becoming district manager a year later. He moved from that post to assistant area manager of sales in the Midwest and, in 1957, took over the sales management of the entire Central Division.

Quinn Joins O.E.L.

John M. Wittke, President of O.E.L., Inc., aerosol valve manufacturers, has announced the appointment of Mr. John K. Quinn as Sales Manager for New England and New York State.

Mr. Quinn, formerly Assistant Sales Manager for Risdon Mfg. Co. will handle valve sales, as well as custom plastic molding for Wagner Plastic Corporation, a wholly owned subsidiary of O,F,L, Inc.

Competition was keen and new sales records were made as Krylon Sales Representatives vied for the annual award for outstanding Sales Achievement, presented at the National Sales Meeting, this September at Chicago. The 1960 Award for outstanding Sales Achievement produced a spectacular tie for top honors, and duplicate awards were presented to Glenn B. White & Assoc., Inc., Redwood City and Los Angeles, Calif., and The Newhope Corp., N. Y., by James W. Bampton, President, Krylon, Inc., Norristown, Pa. (left to right) Richard C. Newbold, Krylon Vice President, Sales; Glenn B. White, President, Glenn B. White & Assocs., Inc.; James W. Bampton, President, Krylon, Inc.; Lee Rocke, President, The Newhope Corp.; Elmore E. Kayser, Krylon Vice President, Advertising.

Elgin Introduces New Gallon Twin Filler

New, high-speed production gallon twin filler for a wide range of viscous and semi-viscous products has just been introduced by Elgin Manufacturing Co., Elgin, Ill.

Elgin spokesmen point to the new model's low cost, efficient operation as representing double as much trouble-free output for packers.

Exact control of the amount of fill, height of containers and desired production speeds are quickly handled. The piston stroke which governs the amount of fill is adjusted by a single micrometer screw adjusting handle. The upper table assembly can be set quickly for different container heights by a single hand wheel. The adjustable bottom fill mechanism lifts containers over the filling nozzles so that filling takes place as the containers are being lowered.

emulsions

the perfect mixer. Piccopale emulsions improve the quality and salability of latex and water-based protective coatings by fortifying the important properties of these products. Specific advantages include: Excellent pigment binding and adhesion, easy soil removal, high resistance to alkalies, low cost. A complete line is available, with grades to meet a wide variety of formulations. Use Piccopale Emulsions to give your products extra sales advantages. Increase profits with fortification.

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EPOXY COATINGS

(*From page 35*)

ingredients which may be useful in attaining a specific objective.

Presumably the reactions involved in the cure are those discussed by Dearborn et al. (Reference 5) and Fisch et al. (References 6 and 7).

Coating Cured at 200°F. or at Room Temperature

Experimental. The next objective was the development of a PMDA-cured epoxy resin coating system that would possess a useful balance of properties after a cure of 20 minutes at 200°F., or several days at room temperature. The major variable at this stage of the work was the use of epoxy resins with various structures which are identified in Table III. A solution of PMDA-Dow Resin X-2635 adduct was used as the standard curring agent (Table II). The final solvent system was MIBK/methyl "Cellosolve" acetate/xylene (2/1/1). The solutions were made up to 35% solids. The solutions were allowed to stand over night before use. The substrate was "Bonderite" 1000-treated, cold-rolled steel. Other conditions and tests were the same as discussed in the previous section. Various ratios of ingredients were studied, and the ratios presented in Table VII are regarded as near optimum. "Resimene" 882 was used at 5% of solids to promote leveling and rate of cure.

Results and Discussion. As shown in Table VII, eight epoxy resins of various structures were cured with the PMDA-Dow Resin X-2635 adduct solution at 200°F., as an initial test. Next, several of the more promising resins were evaluated for anhydride cure at room temperature for seven days. Three resins (Dow Epoxy Novolac 438, PAGE, and "Epon" 812) showed considerable reactivity when cured at room temperature with PMDA-glycol adduct, and they developed substantial MEK resistance within 7 days. Physical properties (mandrel bend, reverse impact, abrasion resistance) were quite satisfactory (Table VII). Dow Epoxy Novolac 438 with an aromatic structure provided the best resistance to boiling water. "Epon" 812 (562) and PAGE, with aliphatic structures, provided better resistance to MEK in extended tests. The blending of resins may provide the optimum balance of properties. The role of various catalysts other than the urea or melamine resins has yet to be explored; the use of more powerful catalysts may accelerate the cure considerably.

To summarize, several promising epoxy coating formulations cured by an anhydride at room temperature have been developed. This opens up new areas to be explored in coating, laminating, and adhesive applications.

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NPVLA HOLDS 73rd MEETING in CHICAGO

Pres. Battley discusses sales gimmicks, product improvement and publicity.

THE seventy-third annual meeting of the National Paint, Varnish and Lacquer Assn., Inc., was formally opened by Joseph F. Battley, President.

Highlight of the session was the presentation of representatives from twelve foreign countries to the audience by Pres. Battley, and their acknowledgement, followed by the short talk given by the Chilean Ambassador, Walter Muller, who stated that today, a diplomat not only must represent his country, but also keep in touch with all industrial developments in the country to which he is appointed.

President Battley then introduced representatives of other branches of the industry, Stephen L. Wolf, president of RPWDA, who stated that it always gave a retailer happiness to talk to manufacturers and tell them how to run their business, and then spoke briefly of the work which his group has done in smoothing the policy of the organization. Leon Switzer commented that not only was he here to extend greetings and congratulations of the PDCA but to remind the Association that it was seventy-seven years ago that his group was officially organized and has been in existence longer than the manufacturers.

Ferris White, representing the Can Manufacturers Association, which is celebrating its 150th year in business, said that the celebration was being held on five continents and in thirty-seven countries. After accepting the resolution presented by the board of directors of NPVLA, he in turn handed to Pres. Battley a gold can, set in a red-velvet box.

Pres. Battley stressed several points that are important news in the current situation: The two-for-one sales gimmicks, and stated that in Chicago one chain opened fourteen stores in the spring but is now down to seven. That intensified pressure must be put on improving products, and that the Association should be kept informed of both improvement and also of new products so that wide publicity through the trade magazines and newspapers could be given. "We have competition from compact cars and definitely so from color TV for even unpainted shacks have TVs," he said. He gave particular emphasis to the need for research and development of new materials that fit into the space age and especially as these will affect the products being offered on the market today.

Pres. Joseph F. Battley

He also expressed the idea that the paint industry, as such was not going after the trained engineers, and could if it would put to use graduates from high school who had had one year of chemistry.

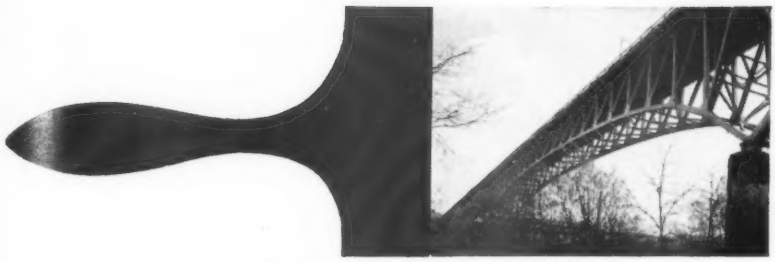
In conclusion, the Battley stated that it was essential "we police our own industry or the Government will, and we all know from past experience what that means and I was then on the other side of the fence."

He spoke of the work of the publicity department and how this was moving into newer channels, through TV—some of the skits were shown, as well as booklets put out by shelter papers as well as the Association publicity. He concluded by urging every manufacturer stop talking about inferior paints and step-up on his quality paints.

Leo Cherne, Executive Director, Research Institute of America discussed factors pro and con in regard to the election and analyzed these as each applied to the candidates, and as their ideas may be reflected back into Congress. He expressed the thought that a Summit meeting would be insisted upon and that the new president, before he had become adjusted to his new status, would have to face this, and for it, he predicted failure.

He touched upon the gold situation as a psychological factor being introduced at this particular time, although it could have been done two years ago. Referring to business he stated that in his opinion and the result of careful study the "shallow" recession started in July and will probably continue until that time in 1961.

Despite this the customer has been more optimistic than the business man and has continued to make purchases. He expressed the idea that the year-end Christmas sales might even equal those of the same period last year. In a recession, he pointed out, there are always segments that continue to do a normal business. Yet he felt, that when Congress met it would have heavy pressure put upon it to enact anti-recession measures, but by the time that is done, the situation would have adjusted itself. As to the current decade he predicted there might well be two depressions, of varying depth and length.



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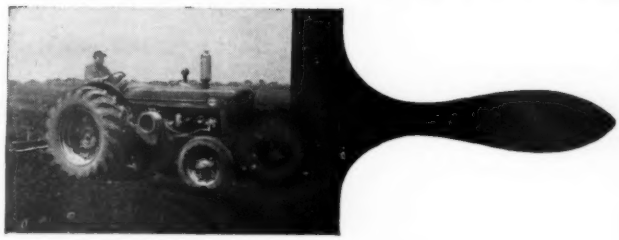

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3500 ATTEND FEDERATION MEETING and PAINT SHOW

Exhibits featuring polyurethane vehicles and color control highlight 25th show.

SOME 3500 members of the Federation of Societies for Paint Technology convened at Chicago's Sherman Hotel for their 38th Annual meeting and 25th Paint Industries Show during October 29—November 2nd.

The latest developments in technology and the production phases of the paint industry accented this year's meeting and show.

Keynote Address

E. Edgar Fogle, president of Union Carbide Chemical Company, in keynoting this annual meeting reminded the audience of the competition now facing the coatings industry and urged that each individual to use his talents to develop better products than competitors have to offer. He further urged management that as a custodians of talent must build a climate of freedom, both in the laboratory and factory, for the future of the world may easily lie in these places, and contribute to future generations.

Pres. J. F. Battley

Joseph F. Battley, president of the National Paint, Varnish and Lacquer Association compared the technical man to the diplomat in importance to his country, and emphasized it was up to him to maintain quality in all the products he offered on the market.

"Fortunately, you and I are part of a great industry which plays such an important role in maintaining the healthy economic and technological complexion in the United States. And this, too, is important because we must think about — and realize — the importance of a career in the paint industry. You are responsible, individually and collectively, for creating new and better products, that in the final analysis, affect the future of a great industry. I have the strongest conviction that your creative ability can insure that this industry's reputation will remain sound. If you are to contribute anything to the maintenance of freedom, of our way of life, there is no better way than to make a product that is worth more than its sales price."

You have heard my theme over and over again—*sell more quality paint.* You will hear it with increased emphasis and vigor in the months ahead. . . and I submit that these are not just words, but a battle cry to spur the efforts of those who know that we can only assure our future prosperity by making and selling quality products."

Eugene H. Ott

Mattiello Lecture

The 1960 Joseph J. Mattiello Memorial Lecture was delivered by Henry F. Payne, professor in charge of Organic Coating Research and Technology at the University of Florida. The title of Prof. Payne's Lecture was, "Philosophy of Coatings." Prof. Payne discussed in detail certain basic chemical and physical concepts particularly those relating to atomic and electron structure of various elements and chemical compounds and how these compounds may be applied to develop improved polymers and copolymers for paint binders.

Despite major developments in paints for architectural and industrial coatings which have occurred over the past few decades there are demands for even better performance for specialized applications. In attempts to meet these demands new binders have been produced such as the silicones and fluorocarbons. In addition, other types of polymers are under investigation such as those containing phosphorus, boron, and sulfur. Titanium and aluminum organics are being investigated and also coatings which are entirely inorganic.

Eugene H. Ott of Ferbert-Schorndorfer Company of Cleveland was installed as president; William L. Foy of Foy Paint Company, Cincinnati was named president elect; and Charles W. Finegan of Rinshed-Mason Co. in Los Angeles was elected treasurer. C. Homer Flynn remains executive secretary.

Next year's annual meeting and Paint Industries' Show will be held in Washington, D. C., November 1-4, 1961.

Technical Papers

Commercial Production of Isophthalic Acid Alkyd Resins—C-D-I-C Society

The paper starts with a review of the structural chemistry of the isomers of phthalic acid and enumerates the physical and chemical properties of each. Unquestionably the difficulties encountered by synthetic resin chemists in the commercial utilization of isophthalic acid (meta isomer) has been their failure to recognize these differences.

The next step is the practical approach to the use of isophthalic acid in alkyd resins for coatings. The laboratory work using a 4,000 ml. reactor, heated with a glas-col mantle, equipped with agitator, inert gas regulator, air condenser, and recording thermometer is reviewed. Both fusion and solvent cooking techniques are mentioned. Lab work on long, medium, and short isophthalic alkyds with

IF you're trying to reduce quality variations and maintain maximum "customer appeal" in your alkyd finishes, you can get important help on *both* counts by ordering your intermediates from dependable Pittsburgh Chemical Company.

Pittsburgh high purity phthalic anhydride, maleic anhydride and fumaric acid are produced to highest possible quality standards—an important and basic consideration in the production of finishes with superior color and gloss retention, ease of application, durability and fast drying.

As a dependable source of intermediates, we're well experienced—*and ready*—to assist you with your application problems. We'll be glad to make up sample resins, suggest formulations for your special requirements and recommend processing procedures. And, when necessary, our engineers will be glad to consult with yours, right in your plant.

What's your alkyd resin production problem? We'd like to help you lick it. *Call or write us the details today!*

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semi-drying, and non-drying oils and fatty acids is covered.

Next the factory production of these experimental resins in a modern 1,000 gallon kettle in batches of about 12,000 lbs. is covered. This work again parallels the lab work and covers the production batches of long alkyd resin, medium soya modified alkyd, and a short soya modified alkyd.

Evaluation of Leveling by a Drawdown Method—New York Society

Recognizing the need for an accurate method for the evaluation of leveling in production and specification work, Technical Subcommittee No. 44 has designed a simple draw-down blade which makes possible rapid, reproducible, and clearly-defined numerical ratings, correlating well with actual brush-out evaluations.

A Study of Factors Affecting Rusting of Steel and Blistering of Organic Metal Coatings—Pittsburgh Society

Determinations of water and oxygen permeability, water absorption, water extractibles, variations of osmotic pressure and adhesion were made on seven different unpigmented coating vehicles for steel attempting to correlate these with rates of blistering of these films and rates of rusting during water immersion. High extractibles, poor adhesion and high oxygen permeability expedite failure.

Study of Pigmented Coatings for Application to Fiber Glass Products—Northwestern Society

Since World War II, the variety of glass reinforced plastic articles manufactured has increased greatly. Consequently, there arise questions as how best to decorate or finish the original item or more important, how to maintain it in good condition after it has been in use.

It has been the purpose of this work to study various types of coatings for use on fibrous glass articles and to compare the important characteristics of these coatings by means of standard tests.

Infrared Spectroscopy, Its Use as an Analytical Tool in the Field of Paints and Coatings—Chicago Society

The Chicago Society has prepared this laboratory manual in an effort to alert the paint industry to the analytical advantages offered by infrared spectroscopy. This manual and the accompanying library of spectra were designed to rapidly lead the novice into a practical working knowledge of infrared analysis.

Physical Chemistry of Interfaces As Retailed to Coatings—William C. Prentiss (Invited Paper)

Early in 1959, the Technical Committee of the Philadelphia Society for Paint Technology embarked on an educational program to provide a background for new research projects. As the first venture, a series of seminars on "Physical Chemistry of Interfaces as Related to Coatings" was presented starting in the Fall of 1959. Subsequently, the joint educational committee of the Chicago Paint, Varnish and Lacquer Association and the Chicago Society for Paint Technology adopted the same subject for their annual educational program. In this discussion, some of the introductory comments of the seminars are reviewed to illustrate the important relationship between colloids, interfaces, and coatings.

Minimum Film Thickness for Economical Protection of Hot Rolled Steel Against Corrosion—Wouter Bosch (Paint Research Institute Paper)

Exposures for Project No. 3 are completing their third year and are beginning to show very interesting results. However, only 25% of the panels have reached a corrosion rating of 8 or less. Therefore, this paper is only a progress report. It is estimated that after two or three more years of exposure, a final report can be prepared. Meanwhile, panel repainting and re-exposure are being continued along with periodic inspections.

A very limited group of the new panels was prepared and exposed last winter. This was done to clarify the cracking tendency of the phenolic paint and the chalking tendency of the vinyl paint. The underlying purpose of these exposures was to be able to offset unfavorable results with earlier formulations out of deference to suppliers of phenolic or vinyl resins.

The main problems confronting this project are: (1) Methods of handling the reams of data collected. (2) Means of estimating painting costs.

Status of Color and Gloss Measurements in Industry—Mark P. Morse (Invited Paper)

Current practices and problems of color matching and gloss rating by visual and instrumental measurements are described and discussed. Studies by Federation and A.S.T.M. groups to establish standardized conditions for rating color and gloss are described and problems encountered in preparing and maintaining permanent color and gloss standards are outlined. Types of color and gloss measuring instruments used in industry are briefly described and some methods of translating measurement data to visual appearance are given. Results of an A.S.T.M. study of color difference measurements by commonly used spectrophotometers and colorimeters are evaluated. Comments are

made on the advantages of instrumental color and gloss measurements as compared to visual ratings.

Unique Alkyd Constant for Designing and Assessing Alkyd Formulations—T. C. Patton (Roon Award Paper)

A new concept for guiding the alkyd chemist in formulating and assessing alkyd compositions has been postulated, namely, that the ratio of total mols to acid equivalents for any properly formulated alkyd is unity. This is a theoretical alkyd constant. To insure a measure of safety in practical formulations, this alkyd constant may be slightly increased. It is proposed that 1.01 is a reasonable working constant for phthalic anhydride alkyds and that 1.05 is a reasonable working constant for isophthalic acid alkyds.

Although the alkyd constant is derived from theoretical considerations, it is shown to have practical validity by an analysis of some 24 commercial formulations covering a varied range of applications.

Based on the invariance of the alkyd constant, it is possible to assess the feasibility of preparing a tentative or untested alkyd composition, adjust an improperly formulated alkyd to an acceptable composition, or formulate an alkyd starting from scratch.

Preparation and Properties of a Series of Polyester Resins—W. A. Mosher and Edmund A. Zaraglia (Paint Research Institute Paper)

A series of polyesters was made by combining dibasic acids with dihydric alcohols. In this series the number of CH_2 groups between the functional end groups, was increased in a progressive or systematic way on both segments of the molecule. For example, the acids were varied succinic, glutaric, adepic, azelic, sebacic. This was done by bulk polymerization. These polymers were fractionated to give samples of known molecular weights.

Physical data, including spectral data, rheological data, etc., are being obtained on these polyesters. The work is only partially complete but suggests some preliminary conclusions.

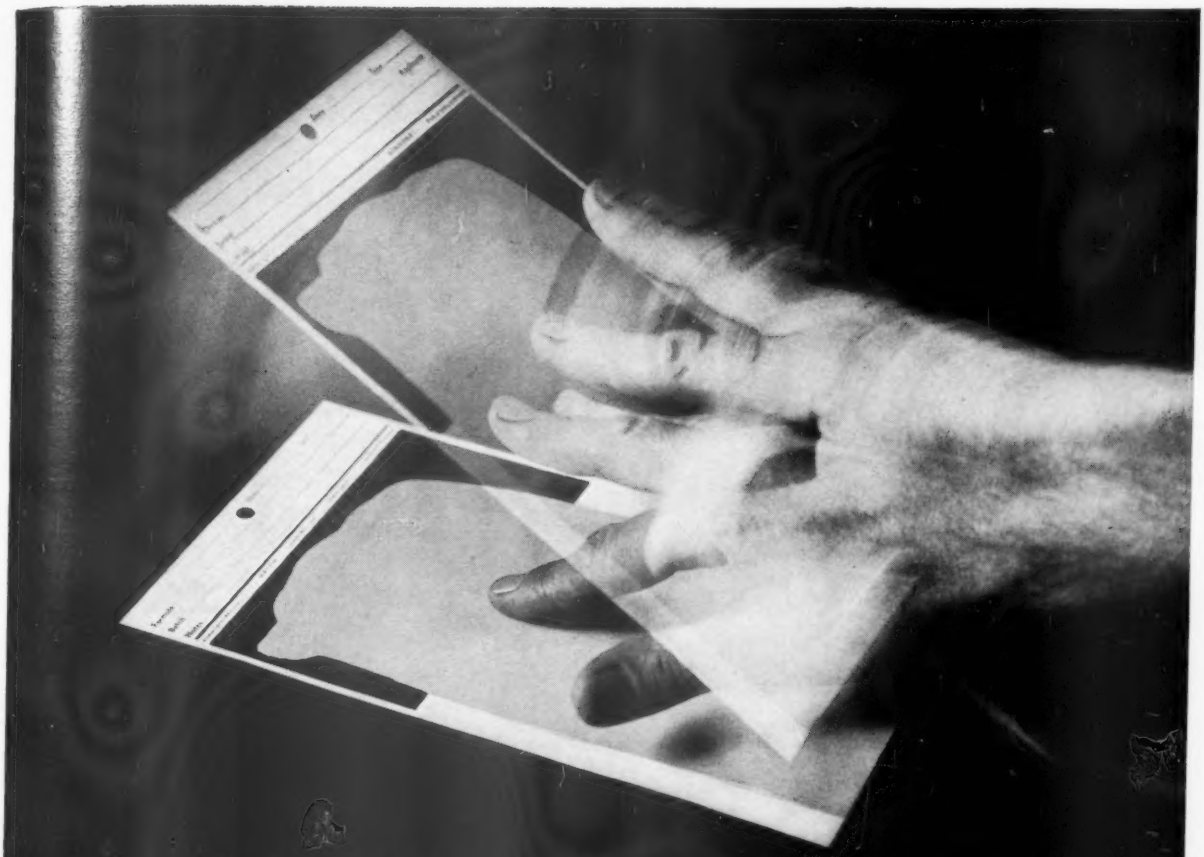
Paint Industries' Show

Polyurethane vehicles, water-thinned vehicle for industrials, and a colorant computer for production color control highlighted the 25th Paint Industries' Show in Chicago.

One exhibitor displayed for the first time fast dry one-can stable polyurethane vehicles, which according to the manufacturer, have high hardness and yet are flexible. Other properties claimed for these polyurethane vehicles include good water resistance, easy pigmentation, and unlimited solvent compatibility. These polyurethane vehicles are recommended for floor finishes, furniture finishes, industrial and maintenance finishes, traffic paints, and marine finishes.

Of particular interest was the first showing of a new water soluble, thermosetting resin which is said to overcome three major industrial painting problems — fire, solvent, toxicity and odor. Properties of the new resin claimed are excellent hardness, fast curing, high impact resistance, water and solvent resistance, good adhesion and flexibility. Also, this water system has good oven baking characteristics after normal flash-off periods and is unlike other water systems which require extended air-dry time to avoid oven blistering. Preliminary tests indicate that this water-soluble resin show promise as an automotive paint primer. Other possibilities include industrial top coat paints for steel drums, coated strip steel and metal toys.

In the way of laboratory equipment. a colorant mixture computer made quite a hit at this year's show. This computer is said to be practical for fast, accurate shade matches and production color control in the coatings industry. Suitable pigments or colors to match the sample under all lights are quickly determined. The correct amounts of each colorant required are read directly from the computer dials. Advantages of this computer are increased production by reducing the number of adds required to correct a batch, improves quality by eliminating reliance on visual color judgements, simplifies formulation by reducing the number of pigments required to match a particular shade, and reduce cost by decreasing equipment



Why many paint manufacturers are re-evaluating their drier combinations

Classical drier combinations usually include lead, cobalt and manganese. However, alternate combinations may create superior drying efficiency, impart improved pigment wetting, and better compatibility of various vehicles. Often the result is greater economy. Savings are realized when you use the drier best suited for the particular job. The chart below includes just a few special uses of some of the many Witco driers.

Drier	Special Applications
CALCIUM	Small amounts of calcium naphthenate stabilize lead—prevent its precipitation. This maintains drying efficiency and eliminates hazing. Calcium can replace lead when desired. It is a good wetting agent for hard to grind pigments—will help prevent "blooming" and "silking." Calcium octoate helps forestall "gas checking" or "frosting."
COBALT	A useful promoter along with peroxides for curing polyester—fiberglass reinforced resins at room temperature.
IRON	Iron naphthenate will eliminate, partially or completely, loss of dry in paints pigmented with iron oxides or carbon blacks. The wetting action of iron naphthenate results in better grinds and superior gloss in carbon black pigmented finishes. The "orange-peel" effect, which sometimes results from baking a carbon black finish on metals, is minimized.
LEAD	Lead naphthenate wets pigments that are hard to grind—can be added to the mixing paste.
MANGANESE	Used in making wrinkle finishes.
ZINC	As a wetting agent, zinc will shorten mixing and grinding time for pigments such as toluidine reds, cadmium reds and iron blues. Overdoses of cobalt can be rectified by adding two to three times as much zinc as the amount of cobalt present.

When you re-evaluate your driers, our skilled technicians and modern laboratories stand ready to assist you. Write Witco at the address below.

Witco's broad line of driers includes—Tallates ■ Octoates ■ Naphthenates ■ Emulsive® types.

In addition to driers, Witco manufactures a broad line of other paint chemicals including Carbon Blacks ■ Metallic Stearates ■ Phthalic Anhydride ■ Surface Active Agents ■ Plasticizers.

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Resins and Emulsions

A low molecular weight polystyrene resin which is compatible with most commercial epoxy resins, especially those of bisphenol A type; a styrene acrylate copolymer soluble in low-cost solvents; a new group of high-molecular weight, linear polyester resins which can be formulated into coatings which show outstanding resistance to abrasion and ultraviolet light with excellent adhesion, clarity, hardness and electrical properties.

Acrylic type tri-polymer emulsion with improved tint retention and durability.

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Non-toxic, powdered organic microbicide for non aqueous paint systems; suspending agent for all pigments forming hard sediments in nitrocellulose lacquers and baking finishes, a 100% active, nonionic emulsifying agent designed for the preparation of oil based emulsion house paint primers and finish coats.

Solvents

Two new high boiler solvents combining the general properties of ketones and glycol ethers for formulating coatings based on acrylic, nitrocellulose, vinyl, urethane, or epoxy resins; methyl isoamyl ketone, a solvent retarder, for superior flow-out and leveling at higher solids content with a minimum retention in the film.

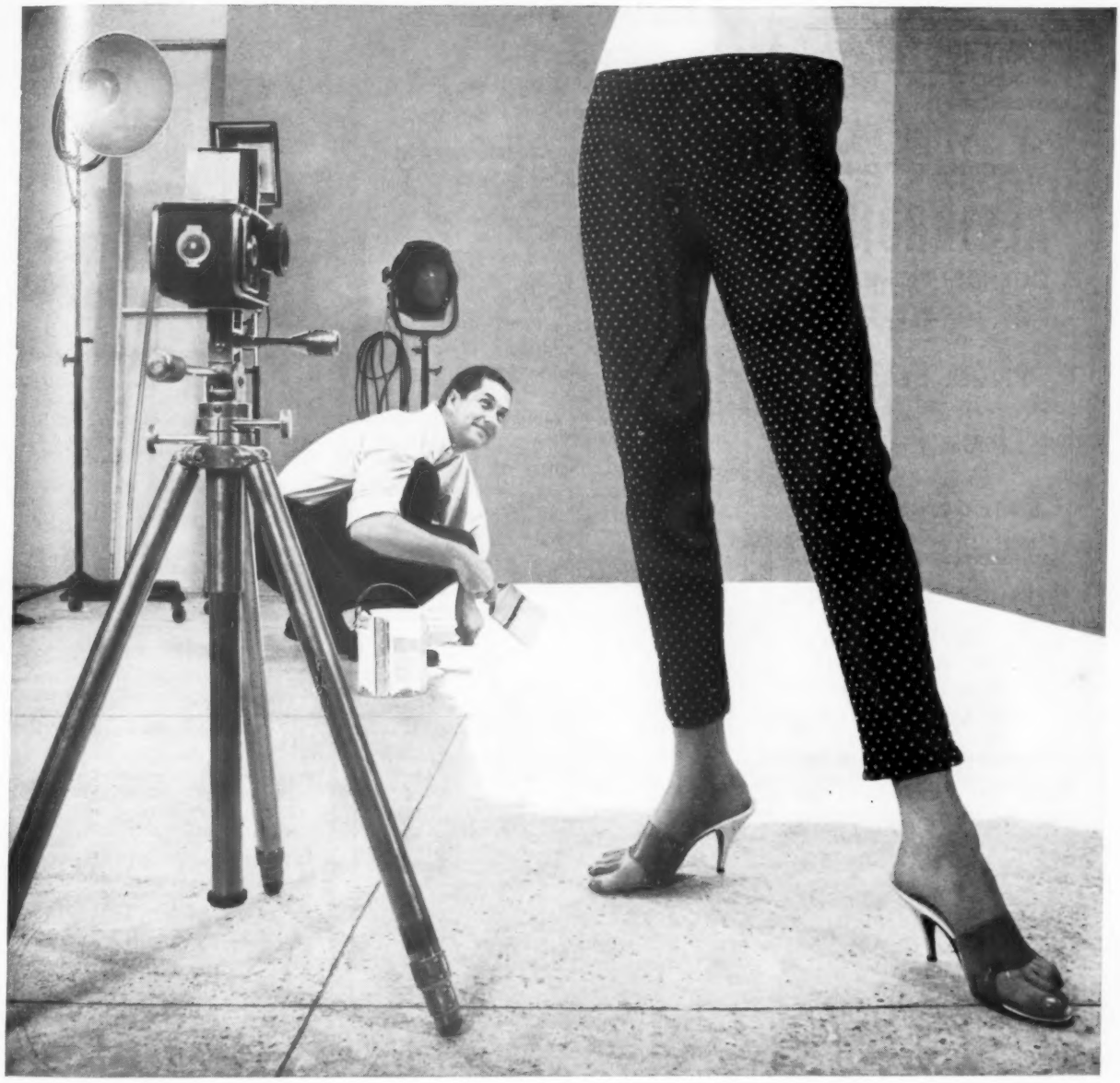
Pigments and Extenders

Cadmium selenide reds and maroons show permanency, heat resistance, ease of dispersion and non-bleeding properties; vat pigment which possesses good tinctorial strength and is claimed to be unsurpassed for producing rich maroon tones; an inorganic red offers non-bleeding, ease of dispersion properties; quindacridone pigment possessing a clean brilliant red-violet hue and suggested for use in alkyd enamels, nitrocellulose lacquers, printing inks, vinyl products, etc.; low opacity synthetic iron oxides provide light fastness, ultraviolet screening, are non-toxic, acid-alkali stable and are readily dispersed and non-bleeding; colloidal dispersion in dry chip form containing 15% improved high jetness carbon black for producing high color and gloss lacquers; a new grade of synthetic hydrous calcium silicate for emulsion paints is said to show good hiding power in low concentrations.

Equipment

New 50 horsepower multi-phase mixing and dispersing unit; dissolver designed for low to medium volume ranges; completely automatic high-speed dispersers; variable speed portable agitator for small production batches; jar rolling equipment equipped with rolls made of electrically conductive Neoprene which eliminates the build-up of static electricity, and an accelerated weathering device using a new powerful arc lamp as the source of radiation.

Arriving by plane and ship in New York City, a delegation of twenty-five influential executives of the West German Paint & Lacquer Industry commenced their three week visit to the United States by a tour of the United Lacquer Manufacturing Corp. plant in Linden, N. J. At the United plant they saw the operation of a firm engaged in producing unusual industrial coatings. Kurt Vincentz of the trade magazine *Farbe und Lack* stated that their purpose in coming is to study methods, production, equipment, and products of the industry in this country.



TITANOX® can brighten your picture, too...

. . . whether you're a photographer applying flat white paint to a studio floor to provide high diffuse reflection . . . or a paint formulator looking for a way to improve the quality of your flat white paints at an attractive cost.

TITANOX white titanium dioxide pigments are established favorites in the paint industry for making flat white paints. For organic solvent types, TITANOX-RCHT (30%TiO_2) and TITANOX-C-50 (50%TiO_2)—both carrying their own extender for most effective dilution of rutile titanium dioxide—give the highest brightness and hiding at lowest cost. For emulsion flats, easy dispersing, high-hiding TITANOX-RA-50 rutile "pure" titanium dioxide is preferred. Not only for whites, but for tinted flats too, these pigments fit the most exacting production schedules and paint quality requirements.

For all types of coatings, from the flattest flat to the sharpest gloss, one or more types of TITANOX are always in the paint manufacturing picture. Titanium Pigment Corporation, 111 Broadway, New York 6, N. Y.; offices and warehouses in principal cities. In Canada: Canadian Titanium Pigments, Ltd., Montreal.

TITANIUM PIGMENT CORPORATION
SUBSIDIARY OF NATIONAL LEAD COMPANY

TITANOX

7788

NEWS

New Divisions Organized By General Aniline & Film

Appointments of general managers of three newly organized divisions were announced by General Aniline & Film Corp. Dr. C. C. Schulze has been named to head the Antara Chemicals Division, Joseph W. Conlon the General Dyestuff Division, and Robert J. O'Brien the Collway Pigments Division.

The headquarters of the three newly organized divisions of the corporation which formerly comprised the Dyestuff & Chemical Division will be at 435 Hudson St.

The divisions have manufacturing operations in Rensselaer, N. Y., Calvert City, Ky., Huntsville, Ala., and in Linden and Paterson, N. J.

All three of the newly appointed general managers held executive positions in the former Dyestuff & Chemical Division.

CALENDAR

December 3-9. Chemical Specialties Manufacturers Assn., 47th Annual Meeting, Hollywood Beach Hotel, Hollywood, Fla.

December 4-7. American Institute of Chemical Engineers. Statler Hotel, Washington, D. C.

December 8. Synthetic Organic Chemical Manufacturers Assn. Annual Meeting. Hotel Roosevelt, New York, N. Y.

1961

January 25-27. 34th Annual Convention of Assn. of American Soap & Glycerine Producers, Waldorf-Astoria Hotel, New York City.

February 23. Protective Coatings Div. of the Chemical Institute of Canada, Divisional Conference, Toronto, Ontario.

February 24. Protective Coatings Div. of the Chemical Institute of Canada, Divisional Conference, Montreal, Quebec.

March 15-18. Annual Convention of the Southern Society for Paint Technology. Atlanta Biltmore Hotel, Atlanta, Ga.

May 5-6. Southwestern Paint Convention of the Dallas and Houston Societies for Paint Technology, Houston, Tex.

May 18-20. Southwestern Paint Convention of the Dallas and Houston Societies for Paint Technology, Houston, Tex.

May 26-27. Fourteenth Annual Spring Symposium of The Pacific Northwest Paint & Varnish Production Club. Hotel Georgia. Vancouver, B. C.

June 2-3. Annual joint meeting of the Kansas City and St. Louis Societies for Paint Technology, Kansas City, Mo.

June 5-9. Plastics Exposition sponsored by the Society of the Plastics Industry, New York Coliseum.

June 20-27. 6th Paint Short Course for High School Chemistry Teachers, University of Missouri School of Mines and Metalurgy, Rolla, Mo.

Have you evaluated these Wyandotte products...lately?

Wyandotte has developed a wide range of inorganic and organic chemicals that do their best work in your paint formulations. Chemicals indispensable for basic formulating needs. Chemicals that will improve the quality of your paint without increasing costs. Chemicals that help you maintain your present quality — while reducing costs. And all Wyandotte chemicals can be counted on for commercial uniformity and purity.

REDUCES PIGMENT COSTS

PURECAL® — a series of precipitated calcium carbonates of exceptional uniformity, whiteness, and chemical purity. For best flow and leveling, particles are agglomerate-free and consistently cubical in shape within each grade structure.

PURECAL O is used as a pigment extender in paints and enamels. Whiter than most prime pigments, PURECAL O can replace up to 10% of titanium dioxide without decreasing brightness or opacity. And all, or part, of "less-bright" extenders may be replaced with PURECAL O without adding extra prime pigments for masking. PURECAL O also prevents settling of coarser pigments, helps prolong shelf life.

PURECAL T is ideal as a paint additive because of its extremely fine particle size. Small additions of PURECAL T raise viscosity rapidly and eliminate sagging without sacrificing gloss. When small amounts of PURECAL T are added to the grinding mix, finer grinds are obtained.

PRODUCES INEXPENSIVE EMULSIFIERS

CAUSTIC SODA, added during the refining of linseed oil, removes impurities in the form of alkali soaps. These alkali soaps provide inexpensive, efficient emulsifying agents for emulsion paints. Caustic soda is also an ingredient in cement paints, cold-water paints, and paint removers.

SODA ASH is an important ingredient in the manufacturing of prime pigment ultramarine, a complex sodium aluminum sulfate.

REGULATES VISCOSITY; SUSPENDS PIGMENT

PLURONIC® POLYOLS are surface-active block-polymers available in variable hydrophilic-hydrophobic balances. They act in latex paints as pigment dispersing and leveling agents and help control viscosity. In similar functions, the PLURONIC POLYOLS have also found usefulness in tube-tints and other water-based systems.

Put this line of Wyandotte products to the test in your own paint formulations. Write us today, detailing your needs. We'll be glad to send you the technical data and samples you require. *Wyandotte Chemicals Corporation, Dept. 888, Wyandotte, Michigan. Offices in principal cities.*

WYANDOTTE CHEMICALS

MICHIGAN ALKALI DIVISION

PACING PROGRESS WITH CREATIVE CHEMISTRY®

NEWS

Phillips Announces New Benzene Plant

Phillips Petroleum Co. will construct a plant to produce high-purity benzene at its Sweeny refinery south of Houston, Texas. Benzene shipments will begin by mid-1961.

Design capacity of the plant is 22,000,000 gallons a year. Benzene is a basic raw material for such major industries as synthetic rubber, plastics, detergents, and synthetic fibers.

Pittsburgh to Expand

Pittsburgh Plate Glass Co. has a factory and laboratory expansion program underway at its East Point, Ga. paint factory.

Approximately 25,000 square feet of factory and laboratory space will be constructed. Additional tank storage facilities will be provided to supply the expanded manufacturing areas.

This is the first expansion since the East Point plant was placed in operation in 1952.

Substantially increased demand for industrial finishes, including automotive finishes, exterior siding coatings and mirror backing materials led to the decision to expand.

Constituent Society Meetings

Baltimore, 2nd Friday, Marty's Park Plaza Hotel.

Chicago, 1st Monday, Furniture Mart.

C.D.I.C., 2nd Monday.
Cincinnati — Oct., Dec., Mar., May, Dick Perfidio's Wishing Well.
Dayton — Nov., Feb., April, Hotel Gibbons.
Columbus — Jan., June, Sept., Everglades.

Cleveland, 3rd Friday, Cleveland Engineering & Scientific Center.

Dallas, 1st Thursday after 2nd Tuesday, Lucas B & B.

Detroit, 4th Tuesday, Rackham Building.

Golden Gate, Monday before 3rd Wednesday, Sabella's Restaurant, San Francisco.

Houston, Monday prior to 2nd Tuesday, Rams Club.

Kansas City, 2nd Thursday, Pickwick Hotel.

Los Angeles, 2nd Wednesday, Montebello Country Club.

Louisville, 3rd Wednesday, Sheraton Hotel.

Montreal, 1st Wednesday, Qpeen's Hotel.

New England, 3rd Thursday, University Club, Boston.

New York, 1st Thursday, Brass Rail, 100 Park Ave.

Northwestern, 1st Friday, St. Paul Town and Country Club.

Pacific Northwest, 3rd Thursday, Washington Athletic Club, Seattle, Wash.

Philadelphia, 2nd Thursday, Philadelphia Rifle Club.

Piedmont, 3rd Wednesday, Rainbow Supper Club, High Point, N. C.

Pittsburgh, 1st Monday, Gateway Plaza, Bldg. 2.

Rocky Mountain, 2nd Monday, Republican Club, Denver, Colo.

St. Louis, 3rd Tuesday, Rugger's.

Southern, Annual Meetings Only.

Toronto, 3rd Monday, Oak Room, Union Station.

Western New York, 1st Monday, 40-8 Club, Buffalo.

PERSONNEL CHANGES

PENNSALT

C. **Robert Geiser** has been appointed Manager of Product Development for the Industrial Chemicals Division.

As Manager of Product Development, Mr. Geiser will be responsible for developing new markets and uses for existing products as well as analyzing the market potential and developing markets for the firm's new industrial chemical products.

HERCULES POWDER

Elmer F. Hinner and **John M. Martin** were elected Vice Presidents.

SCHENECTADY VARNISH

George Brannick, Jr., has been named a Research Chemist. Mr. Brannick will direct research and development in resins for bonded and coated abrasives.

GENERAL ELECTRIC

Robert L. Daileader has been named Sales Representative for the Silicone Products Department.

R. L. Daileader

J. W. Broomhead

CONTINENTAL CAN

J. W. Broomhead has been appointed General Manager of Production Planning for the Metal Division.

NUODEX

Harvey N. Lieberman has been named Technical Sales Representative. In his new position, Mr. Lieberman will be in charge of Sales Development of new products for the Paint Industry. Working in the Paint Industry Division, Mr. Lieberman will represent the firm in technical sales of new additive chemicals.

HARMON COLORS

John F. Santimauro has been appointed to the newly created position of Manager of Research.

Mr. Santimauro will be responsible for planning and supervising all research and development activities dealing with organic pigments, intermediates, and related products. His headquarters will continue to be at Haledon, N. J.

E. I. DUPONT

John L. C. Brooke has been appointed Assistant Director of Sales.

James H. Baird was appointed Sales Manager of White Pigments, succeeding Mr. Brooke. Mr. Brooke replaces **Edwin A. Gee,** whose appointment as an Assistant Director of the Development Department was announced previously.

PITTSBURGH PLATE

Francis W. Theis has been elected President and Chief Executive Officer. **Bjorn Holmstrom** has been named Chairman of the Board of Directors.

As president and chief executive officer, Mr. Theis succeeds Dwight F. Means who is retiring but will continue to serve as a consultant.

SPENCER KELLOGG

Robert E. Ivancic has been named Technical Service Representative with headquarters in the New York office of the company.

MARBON

William A. Suiter and **Rhoda M. Stewart** have been named Vice Presidents.

J. H. DAY

William F. Grobe has been appointed Direct Sales Representative serving Michigan, Northern Indiana, and Ontario, Canada.

CLASSIFIED ADVERTISEMENTS

Rates: $.20 per word, except those seeking employment, for which rate is $.10 per word. Minimum: ten words. Address all replies to Box Number, c/o Paint and Varnish Production, 855 Avenue of the Americas, New York 1, New York.

PAINT FACTORY

For Sale: Paint factory, 4,000 square feet, 9 acres and residence on state highway, Monmouth County, N. J. Box 1260.

NAFTONE

J. Corson Smith has been appointed Assistant Sales Director.

Mr. Smith joined the firm as a salesman in 1952. In his new position, he will assist in the supervision of the firm's agents and its sales force.

J. C. Smith

H. L. Ford

EASTMAN

Henry L. Ford has been elected President. He succeeds **Dr. L. K. Eilers,** who becomes Vice Chairman of the Board of Directors.

CATALIN

Lee Stark has been named a Sales Representative. Mr. Stark will be located at the firm's New York office.

COMMERCIAL SOLVENTS

Louis L. Hallock has been named Technical Supervisor for the newly created Nitroparaffins Department.

NUODEX

Herbert J. Meyer has been named Southwest Regional Sales Representative. In this capacity, Mr. Meyer will coordinate activities of sales agents in the south-western territory, which includes Texas, Oklahoma, Louisiana, Arkansas and part of Kansas and Tennessee.

JOHN J. FANNON

Fred W. Steinhebel has been appointed as Manager of Technical Coatings Division.

SANDOZ

Sidney Braverman has been appointed Supervisor, Pigment Applications Laboratory.

ARMOUR

John W. Anthony has joined the firm as a sales representative headquartered in Dallas, Tex.

COMMERCIAL SOLVENTS

William H. Skelly, Jr. has been named Manager of the Mid-Atlantic District for the Industrial Chemicals Department.

In his new capacity, Mr. Skelly will supervise the activities of a group of sales representativesketing methanol, methylamines, ammonia, ethyl alcohol and other basic chemicals in an area which includes all of the Atlantic sea board states from New Jersey to Florida

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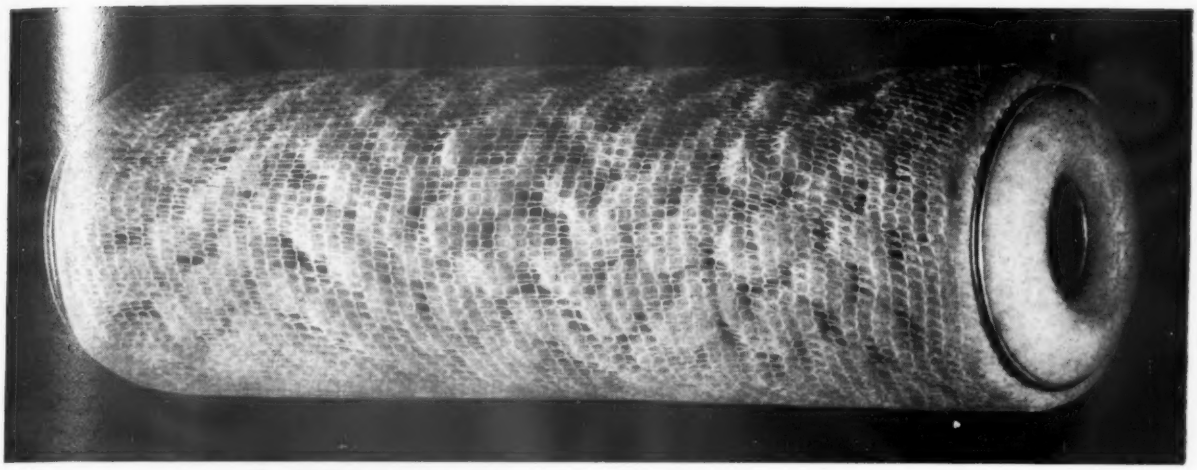

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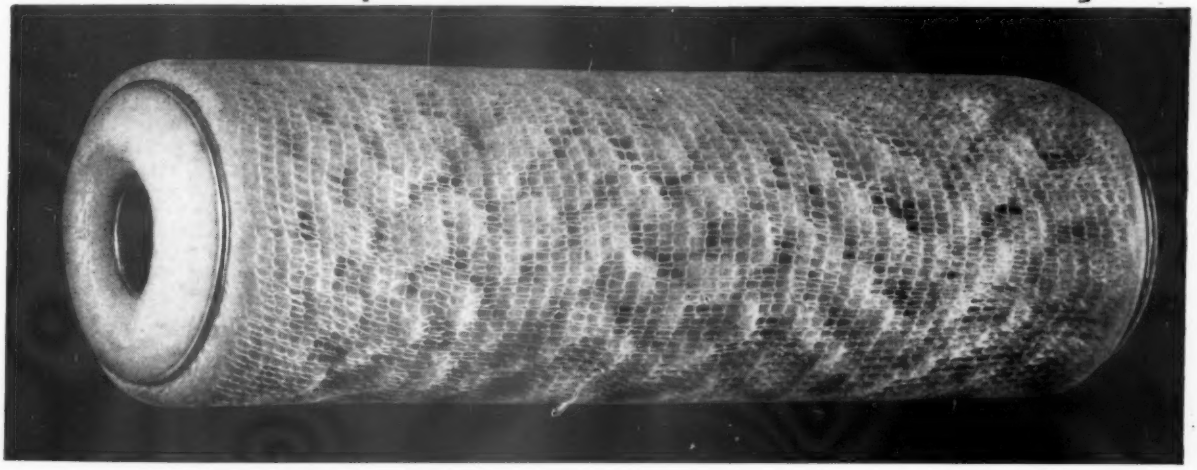

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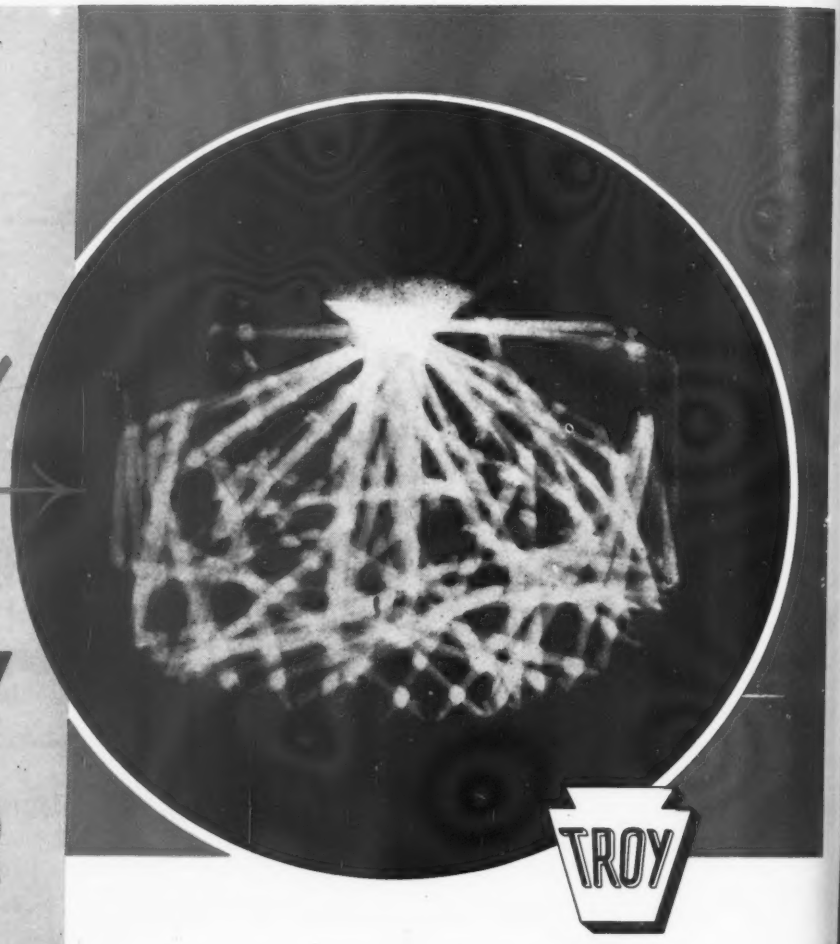

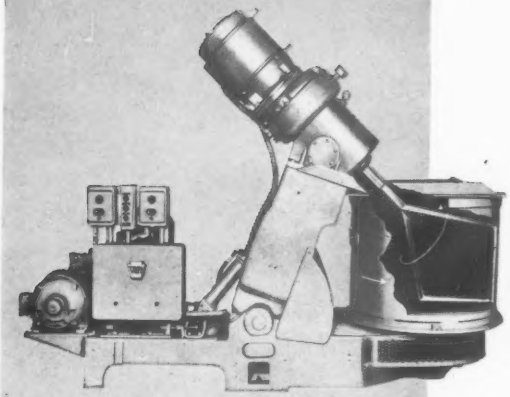

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